

RCRA PART  
ADMINISTRATIVE RECORD  
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TOTAL NUMBER OF PAGES \_\_\_\_\_

FILE COPY

Underground Storage Tank Investigation  
Terminal 91  
Seattle, Washington

Prepared by:  
SCS ENGINEERS  
1008 140th Avenue N.E.  
Bellevue, Washington 98005

Prepared for:  
Port of Seattle  
Pier 66, P.O. Box 1209  
Seattle, WA 98111

August 14, 1989  
SCS Job No. 0489010.00

USEPA RCRA



3012551

**SCS ENGINEERS**

August 14, 1989  
File No. 0489010

Mr. Dave Aggerholm  
Port of Seattle  
Pier 66  
P.O. Box 1209  
Seattle, Washington 98111

Subject: Terminal 91 Underground Storage Tank Investigation

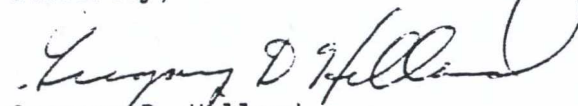
Dear Mr. Aggerholm:

Enclosed are two copies of our underground storage tank investigation regarding the diesel storage tank located at Terminal 91. The laboratory results do not indicate the presence of petroleum hydrocarbons above detectable levels in soil samples collected at the subject site. Therefore, based on the results of this limited investigation, no further investigative work regarding the underground storage tank at Terminal 91 is recommended.

We understand that the Port of Seattle intends to abandon the fuel tank in-place because of its location. As a result, our enclosed report also includes abandonment procedures based on the City of Seattle Fire Department and Washington Department of Ecology requirements.

If you have any questions regarding the report or the data contained herein, please do not hesitate to contact either of the undersigned.

Sincerely,



Gregory D. Helland  
Project Geologist  
SCS Engineers



Richard C. Alvord, C.P.G.  
Project Manager  
SCS Engineers

## TABLE OF CONTENTS

<u>SECTION</u>	<u>PAGE</u>
INTRODUCTION.....	1
REGIONAL GEOLOGIC, HYDROGEOLOGIC, and TOPOGRAPHIC INFORMATION.....	1
SITE GEOLOGY.....	3
ON-SITE INVESTIGATION.....	3
MATERIALS and METHODS.....	5
RESULTS.....	5
CONCLUSIONS.....	6
RECOMMENDATIONS.....	6

EXHIBITS

- |   |                      |
|---|----------------------|
| 1 | Geologic Boring Logs |
| 2 | Laboratory Results   |

## LIST OF FIGURES AND TABLES

<u>FIGURE</u>		<u>PAGE</u>
1	Project Site Location.....	2
2	Location Of Exploratory Borings.....	4
 <u>TABLE</u>		
1	Summary Of Laboratory Results.....	5



## INTRODUCTION

SCS Engineers was retained by the Port of Seattle to perform an underground storage tank investigation at Terminal 91, located at 2001 West Garfield, Seattle, Washington (Figure 1). The purpose of this investigation was to assess the potential for soil contamination, if any, resulting from product released from the underground storage tank located at the facility. The investigation included the retrieval and analysis of soil samples from two exploratory borings.

The tank, estimated at 500-gallon capacity, is located adjacent to the north end of building 38. The tank was formerly used for diesel fuel storage for a generator in the building. Based on available blueprints for Terminal 91, the tank was installed in 1957. Reportedly, the tank has not been used for approximately ten years.

Fuel product has been removed from the tank using a vacuum truck; however, there may be residual fuel remaining in the bottom of the tank. The Port of Seattle intends to properly abandon the tank in place because of its inaccessible location.

The purpose of this investigation was to determine if any soil contamination exists due to potential past releases of product from the tank. No groundwater monitoring wells were installed to sample for the presence of petroleum hydrocarbons in the shallow groundwater.

## REGIONAL GEOLOGICAL, HYDROGEOLOGIC, AND TOPOGRAPHIC INFORMATION

Terminal 91 is situated at an elevation of approximately ten feet above mean sea level (MSL). The site is fairly level, with drainage basically south towards Elliot Bay. The area has a marine climate which is characterized by cool summers and mild winters. Rainfall averages approximately 35 inches per year.

The site is located in the Puget Sound Lowland physiographic area. Repeated periods of continental and alpine glaciation during the Pleistocene Epoch of the Quaternary Period have extensively affected the topography of the area. Evidence of glacial impacts is shown in the north/south trend of the major topographic features.

The uppermost sediments in the Puget Sound area are classified as Vashon drift, which was deposited during the most recent glaciation period, approximately 13,000 years ago. The sediments consist of interbedded layers of sand and gravel deposited during periods of glacial outwash and compact mixtures of silt, clay, sand, and gravel deposited as glacial till. Intermixed within the surficial glacial deposits are undifferentiated alluvial deposits of silt, sand, gravel, clay, and some peat. The total thickness of all sedimentary deposits in the Puget Sound area, including the Vashon drift, may exceed 1,000 feet in some areas.



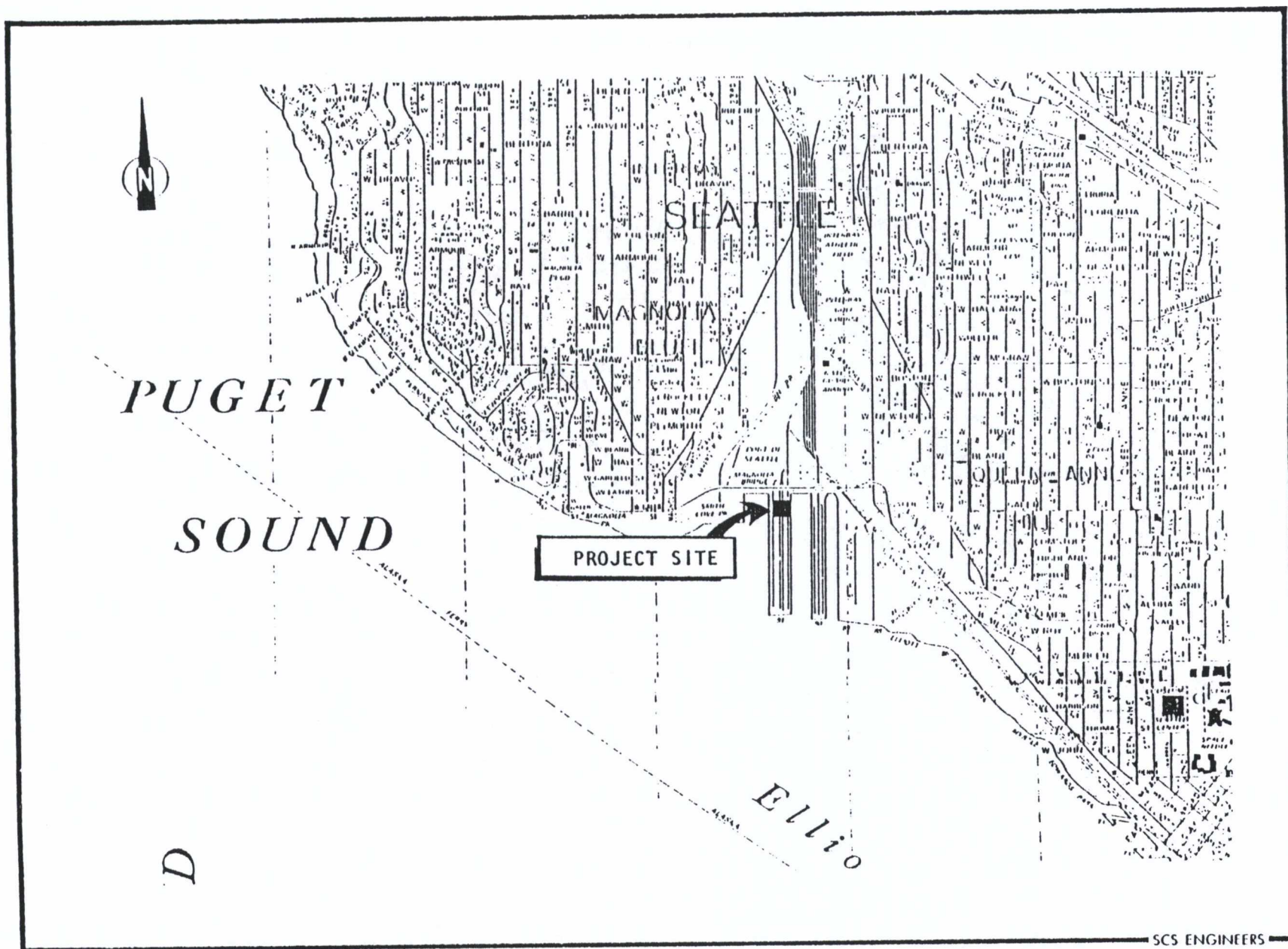


FIGURE 1: Map Showing Site Location (Source: Thomas Brothers Maps)

## SITE GEOLOGY

The following narrative regarding the site specific geology is based on field observations during the drilling. The sediments encountered on-site consisted of grey very fine to coarse-grained sand. The samples collected near the bottom of both borings contained a high percentage of gravel.

Groundwater was encountered approximately nine feet below the ground surface. The depth to groundwater at Terminal 91 is expected to vary daily due to tidal influence. Based on regional hydrogeologic information, the regional groundwater flow direction should be primarily to the west. However, since the terminal is surrounded on three sides by sea water, the local groundwater flow direction may be east or west, depending on tidal influence.

## ON-SITE INVESTIGATION

The on-site investigation was performed on June 28, 1989. Drilling was performed by Soil Sampling Service, utilizing a Mobile B-61 drill rig equipped with a 7.25-inch outside diameter hollow stem auger. Soil samples were retrieved using a standard penetrating sampler driven into the soil with a 140-pound slide hammer.

Prior to drilling, underground utilities at the site were delineated using ground penetrating radar (GPR). The boring locations were selected based on the results of the GPR investigation. As shown in Figure 2, two borings were drilled on-site. BH-1 was located approximately three feet north of the northern edge of the cooling unit. BH-2 was located west of the cooling unit, adjacent to the retaining wall, approximately 3.5 feet below the surface elevation of BH-1.

The soil sampler was cleaned between samples by washing in a solution of Alconox and water, followed by a clean water rinse and a distilled water rinse. The sampler was driven ahead of the auger in order to collect an undisturbed soil sample.

Soil samples were collected in BH-1 at three, six and ten feet below grade. Following the drilling of BH-1, the water table was determined to be approximately nine feet below grade. Soil samples were collected at three and six feet below grade in BH-2. Sampling depths of three and six feet at BH-2 were similar to sampling depths at six and ten feet in BH-1, respectively, because of the lower surface elevation of BH-2. The six foot sample at BH-2 was estimated to be at the water table. No hydrocarbon odors were detected in any of the samples collected.

No soil samples were collected below the water table in BH-2, because petroleum hydrocarbons are less dense than water and thus more likely to be encountered at or above the water table. No groundwater monitoring wells were installed. Geologic logs for each boring are provided in Exhibit 1.

A total of five soil samples were collected during drilling for testing and archiving purposes. Soil samples were logged by our on-site geologist, then placed in sample containers provided by the laboratory.



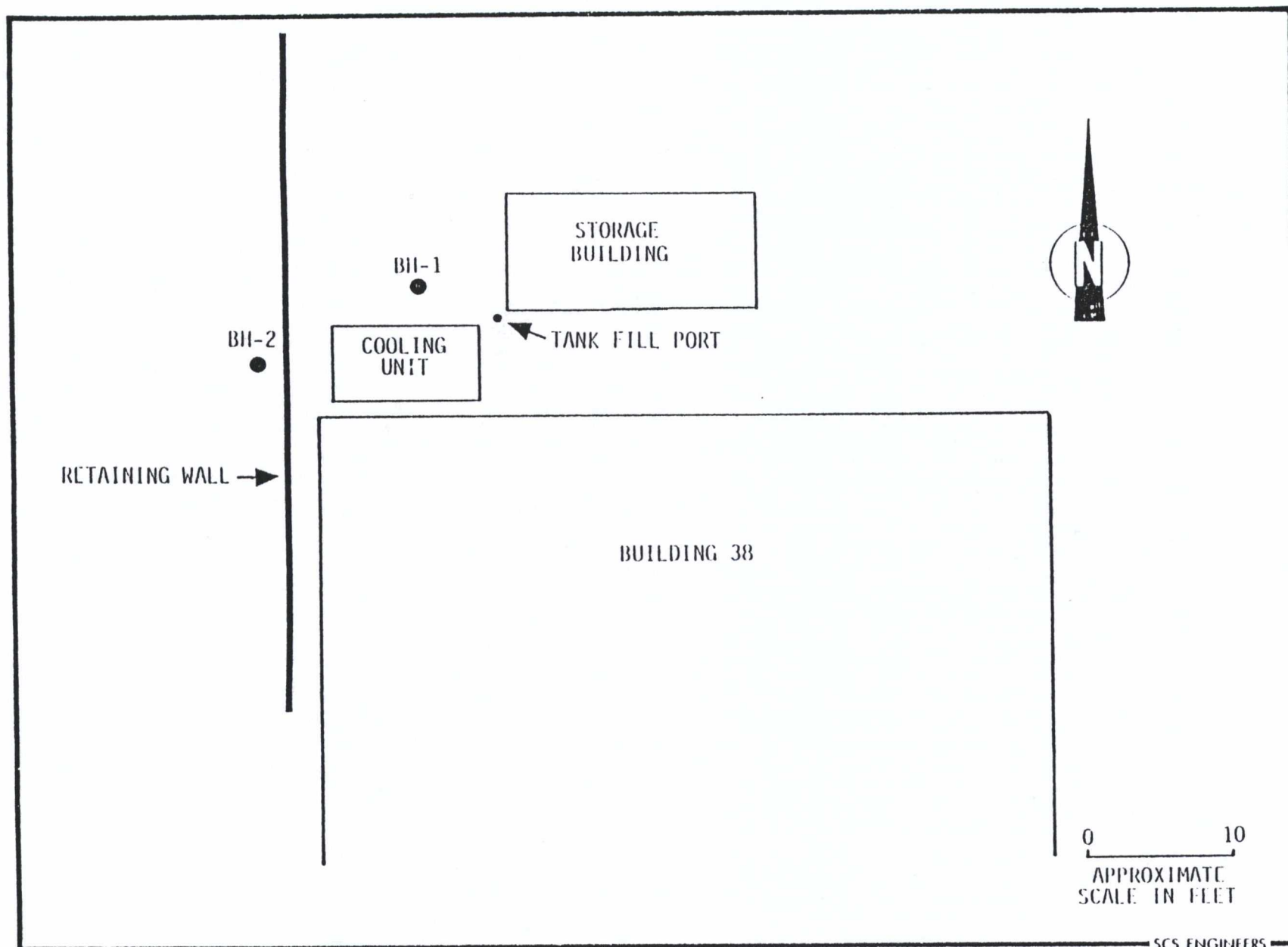


FIGURE 2: Site Map Showing Location Of Exploratory Borings



## MATERIALS AND METHODS

Each soil sample was identified with a sample number and placed in a field cooler for transport to Laucks Testing Laboratories, Inc. in Seattle, Washington. Chain-of-Custody forms were appropriately completed by the field geologist and the laboratory personnel to insure proper and accurate sample tracking and analysis in the laboratory.

Soil samples from each boring were selectively analyzed using the California TPH (total petroleum hydrocarbons) method for petroleum hydrocarbons, which is a gas chromatography method that quantifies and identifies fuels, such as diesel fuel, in the sample. BTEX (Benzene, Toluene, Ethylbenzene and Xylene) analysis were also run on the samples selected for TPH analysis.

Only the lowermost samples from the two borings were submitted for analysis, because these were considered most likely to contain contamination, if any, resulting from product release from the tank. The remainder of the samples were archived at the laboratory for future analysis, if necessary.

## RESULTS

The laboratory results are contained in Exhibit 2. Both of the samples analyzed contained less than 10 parts per billion (ppb) of petroleum hydrocarbons as gasoline, and less than 1,000 ppb of petroleum hydrocarbons as diesel. BTEX concentrations were all less than the detection limit of 10 ppb. The following table summarizes the laboratory results. The sample numbers are listed on the left. The concentrations detected are listed under the various method numbers.

=====

TABLE 1

	California TPH (in ppb)			
	<u>Gasoline</u>		<u>Diesel</u>	
BH1-10	<10		<1,000	
BH2-6	<10		<1,100	
	BTEX (in ppb)			
	<u>Benzene</u>	<u>Toluene</u>	<u>Ethylbenzene</u>	<u>Xylene</u>
BH1-10	<10	<10	<10	<10
BH2-6	<10	<10	<10	<10

=====

## CONCLUSIONS

The laboratory data does not indicate the presence of petroleum hydrocarbons in soil samples collected from borings installed at Terminal 91. Based on the results of this preliminary investigation, there is no evidence that product release has occurred from the estimated 500-gallon underground storage tank.

## RECOMMENDATIONS

Based on the results of this limited investigation, SCS Engineers recommends no further investigative work regarding potential contamination as a result of the underground storage tank at Terminal 91.

The Washington Department of Ecology requires a 30-day notification prior to removal or abandonment of an underground storage tank. In addition, the City of Seattle Fire Department requires a letter requesting approval for abandonment. The letter must contain information regarding site location, site description, and reasons for abandonment in-place rather than removal. Following receipt of the letter, an inspector from the Fire Department will visit the site. A permit will then be issued by the Fire Department detailing the required abandonment procedure.

The Fire Department will require the tank be exposed to the extent possible in order to cut a hole in the top of the tank for cleaning. Residual fuel product must be removed and the tank inerted prior to cutting the tank so no potentially explosive vapors exist. The tank must then be washed out and pumped dry. The Fire Department will inspect the tank to verify the absence of potentially explosive vapors. The tank may then be filled with an inert material, such as a concrete slurry. The City of Seattle Fire Department requests a concrete slurry be used to abandon underground storage tanks in place.

EXHIBIT 1  
GEOLOGIC BORING LOGS



# BORING LOG

**SCS  
ENGINEERS**

Environmental Engineers  
3711 Long Beach Blvd  
Ninth Floor  
Long Beach, CA  
90807-3315  
(213) 426-9544  
FAX (213) 427-0805

## SITE INFORMATION:

PROJECT Port of Seattle  
LOCATION Terminal 91  
JOB NO. 0489010.00  
GEOLOGIST/ENGINEER Greg Helland  
DRILL AGENCY Soil Sampling Service

HOLE/WELL NO. BH-1  
DIAMETER OF DRILL HOLE 7 1/2"  
TOTAL DEPTH OF HOLE 10'  
DATE STARTED 6/28/89  
DATE COMPLETED 6/28/89

DEPTH (ft)	COMPLETION DETAIL	SAMPLE NO.	BLOW COUNTS/ FOOT	USCS SYMBOL	DESCRIPTION
0					
1					
2					
3		BH1-3	3/4/3	SP	3' gray sand, very fine-grained, moist, loose, poorly graded, no odor.
4					
5					
6		BH1-6	14/17/13	SW	6' gray sand, very fine-grained, high % of gravel present, moist, dense, well graded, no odor.
7					
8					
9					
10		BH1-10	14/15/15	SW	10' gray sand, fine to coarse grained, gravel present, wet, dense, well graded, shell fragments present, no odor.
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					

# BORING LOG

**SCS  
ENGINEERS**

Environmental Engineers

3711 Long Beach Blvd  
Ninth Floor  
Long Beach, CA  
90807-3315

(213) 426-9544  
FAX (213) 427-0805

## SITE INFORMATION:

PROJECT Port of Seattle

HOLE/WELL NO. BH-2

LOCATION Terminal 91

DIAMETER OF DRILL HOLE 7 1/4"

JOB NO. 0489010.00

TOTAL DEPTH OF HOLE 7.5'

GEOLOGIST/ENGINEER Greg Helland

DATE STARTED 6/28/89

DRILL AGENCY Soil Sampling Service

DATE COMPLETED 6/28/89

DEPTH (ft)	COMPLETION DETAIL	SAMPLE NO.	BLOW COUNTS/ FOOT	USCS SYMBOL	DESCRIPTION
0					
1					
2					
3		BH2-3	6/9/10	SW	3' gray sand, fine to coarse grained, gravel present, moist, medium dense, well graded, no odor.
4					
5					
6		BH2-6	14/14/18	SW	6' gray sand, fine to coarse grained, high % of gravel present, wet, dense, well graded, no odor.
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					

\* Started at 3.5' lower elevation than BH-1.

EXHIBIT 2  
LABORATORY RESULTS



# Laucks<sup>81</sup><sub>runs</sub>

## Testing Laboratories, Inc.

940 South Harney St., Seattle, WA 98108 (206) 767-5060 FAX 767-5063

## Certificate

Chemistry, Microbiology, and Technical Services

CLIENT: SCS Engineers  
1008 - 140th Ave. N.E.  
Bellevue, WA 98007  
ATTN: Greg Helland

LABORATORY NO. 17306

DATE: Aug. 4, 1989

PO# P-023670

REPORT ON: SOIL

### SAMPLE

IDENTIFICATION: Submitted 06/28/89 and identified as shown below:

- 1) BH1-3 06/28/89
- 2) BH1-6 06/28/89
- 3) BH1-10 06/28/89
- 4) BH2-3 06/28/89
- 5) BH2-6 06/28/89

### TESTS PERFORMED AND RESULTS:

The samples were analyzed by GC/FID following the California DHS method for Total Petroleum Hydrocarbons (TPH), as well as by EPA Method 8020 for Benzene, Toluene, Ethylbenzene and Xylenes. Results were as shown below:

	<u>3</u>	<u>5</u>	<u>Method Blank</u>
Total Solids, %	86.3	90.1	---
<u>parts per billion (ug/kg), dry basis</u>			
Total Petroleum Hydrocarbons, as gasoline	<10.	<10.	<10.
Total Petroleum Hydrocarbons, as diesel	<1,000.	<1,000.	<1,000.
Benzene	<10.	<10.	<10.
Toluene	<10.	<10.	<10.
Ethylbenzene	<10.	<10.	<10.
Xylenes	<10.	<10.	<10.



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PAGE NO. 2

SCS Engineers

LABORATORY NO. 17306

Note: Samples 1, 2, and 4 were on hold without analysis.

### Key

< indicates "less than"

Respectfully submitted,

Laucks Testing Laboratories, Inc.



B. Gleason

BG:emt

cc: Bob Wells, Port of Seattle



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#### APPENDIX A

#### Surrogate Recovery Quality Control Report

Attached is a surrogate (chemically similar) compound utilized in the analysis of organic compounds. The surrogate is added to every sample prior to extraction and analysis to monitor for matrix effects, purging efficiency, and sample processing errors. The control limits represent the 95% confidence interval established in our laboratory through repetitive analysis of these sample types.



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JOB No. 17306 DATE: 08/02/89

Sample No. B0718GVO.S01 Matrix: Soil Analysis: GC-FID

Surrogate Compound	Percent Recovery	Comment	Control Limits
N-propylbenzene	102		70 - 130

Sample No. 3 Matrix: Soil Analysis: GC-FID

Surrogate Compound	Percent Recovery	Comment	Control Limits
N-propylbenzene	98		70 - 130

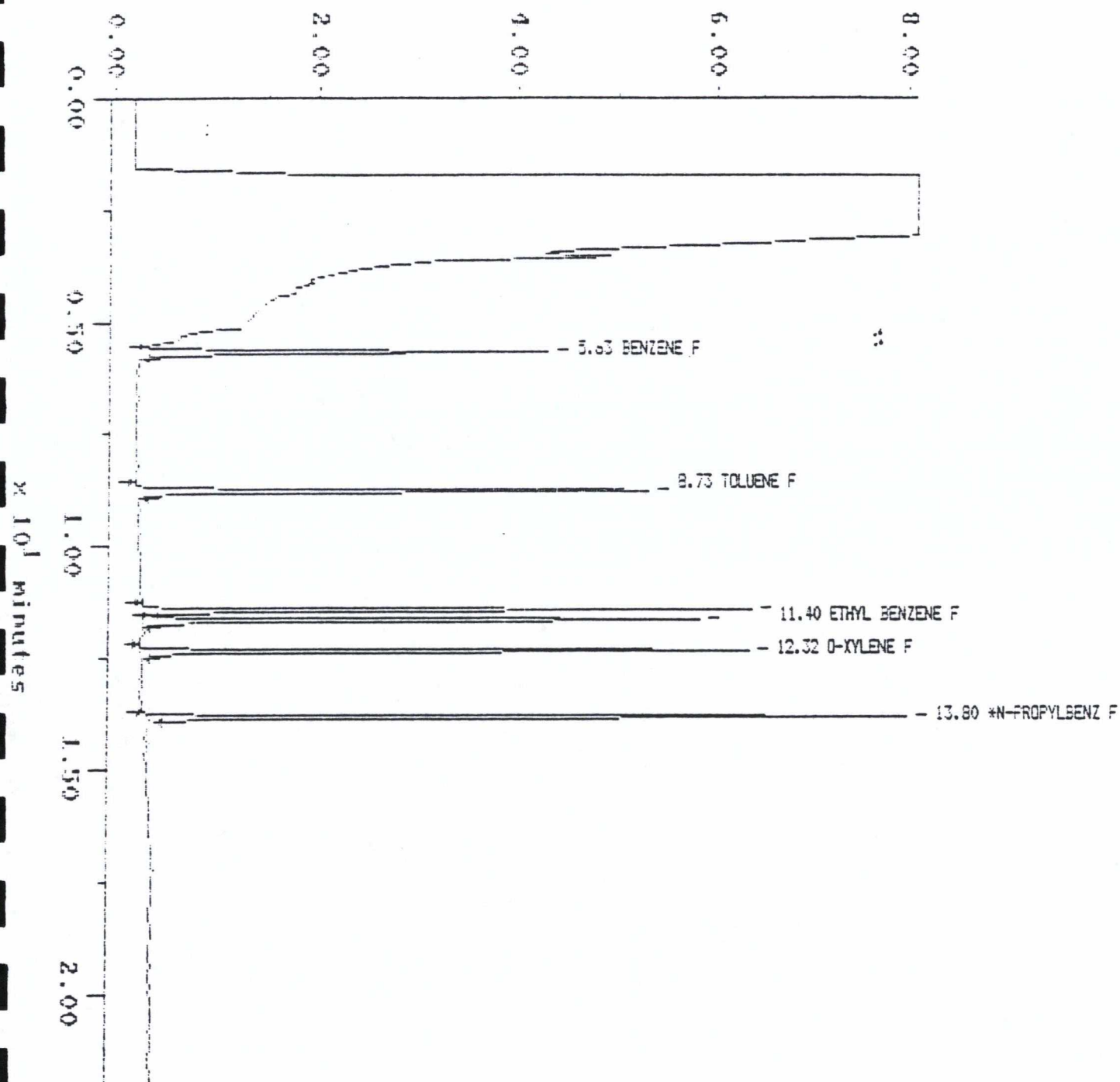
Sample No. 5 Matrix: Soil Analysis: GC-FID

Surrogate Compound	Percent Recovery	Comment	Control Limits
N-propylbenzene	92		70 - 130

Sample: STD #3 17400 Channel: 8890 FID  
Acquired: 17-JUL-89 4:54 Method: STA waters on 8890  
Inj Vol: 1.00  
Comments: + DENOTES SURRGATE

Filename: 107177  
Operator: Bill

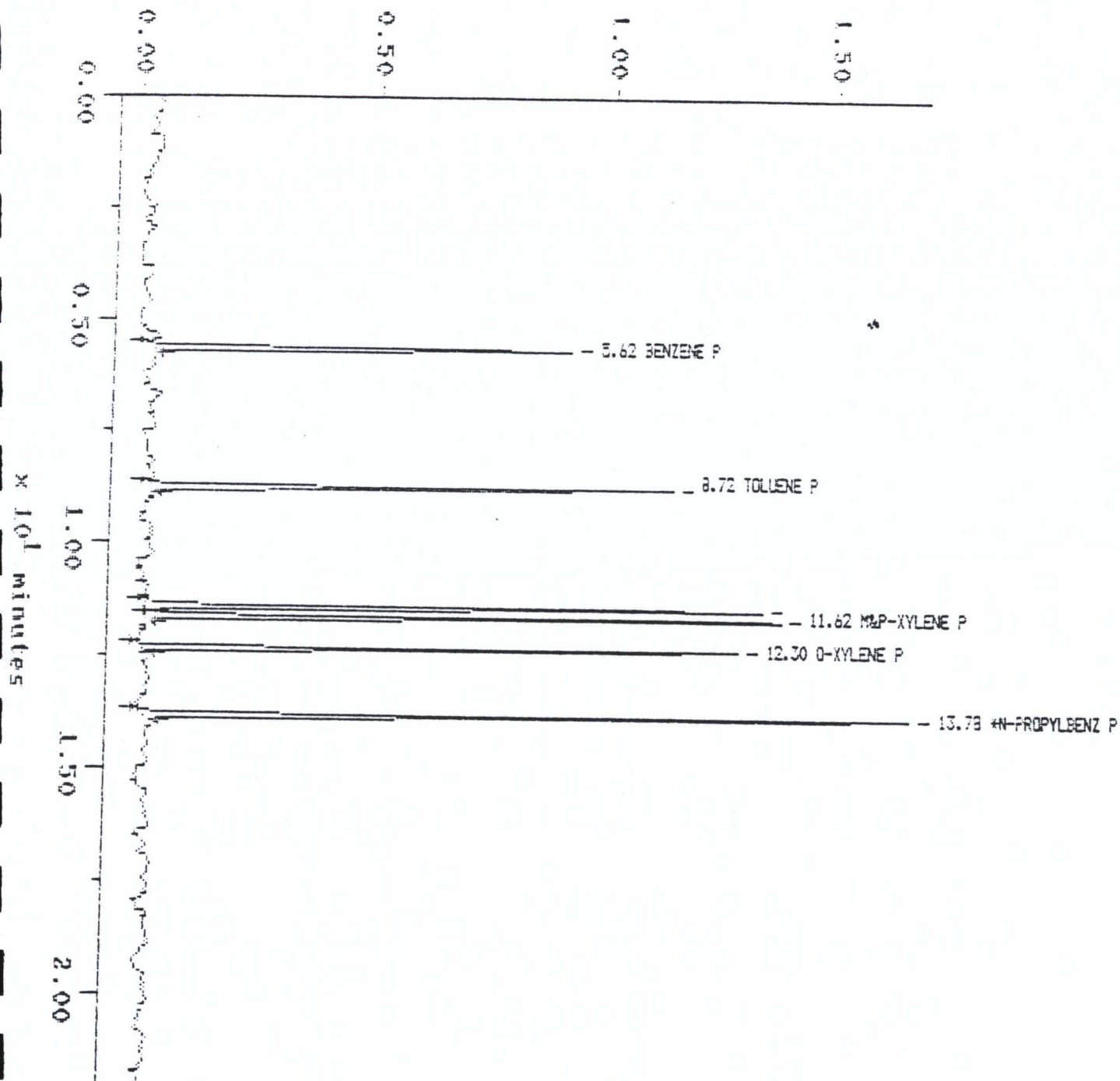
$\times 10^{-2}$  volts



Sample: STD #3 1/400 Channel: 5350 PID  
Acquired: 17-JUL-87 9:54 Method: BTA Waters on 5350  
Inj Vol: 1.00  
Comments: + DETECTOR SURGEONATE

Filename: D07177  
Operator: Bill

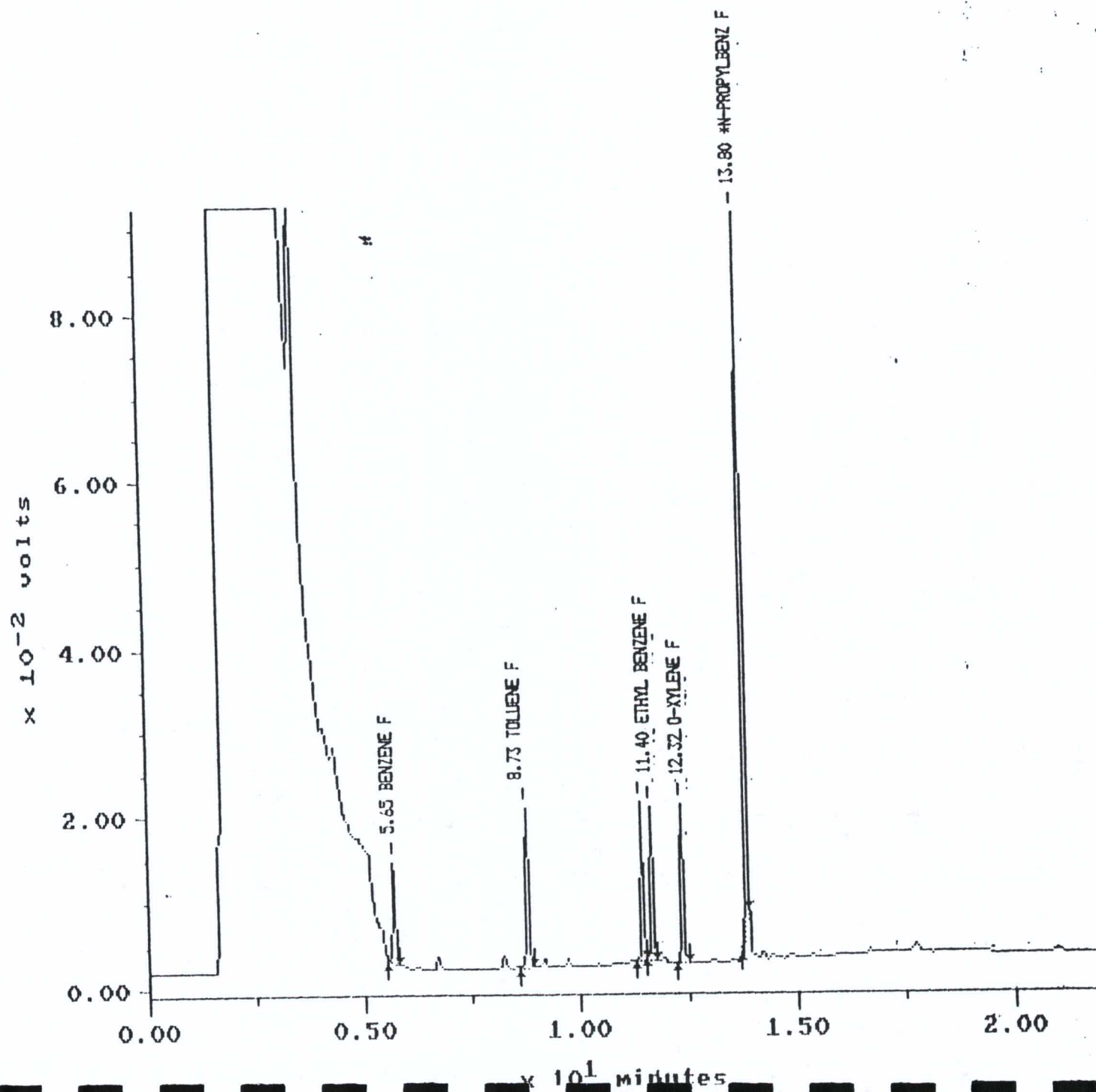
$\times 10^{-2}$  volts





Filename: C07174  
Operator: Bil

Sample: STD #4 1/2500 Channel: 5890 FID  
Acquired: 17-JUL-89 10:23 Method: BTX Waters on 5890  
Inj Vol: 1.00  
Comments: \* DENOTES SURROGATE



Filename: C07174  
Operator: Bil

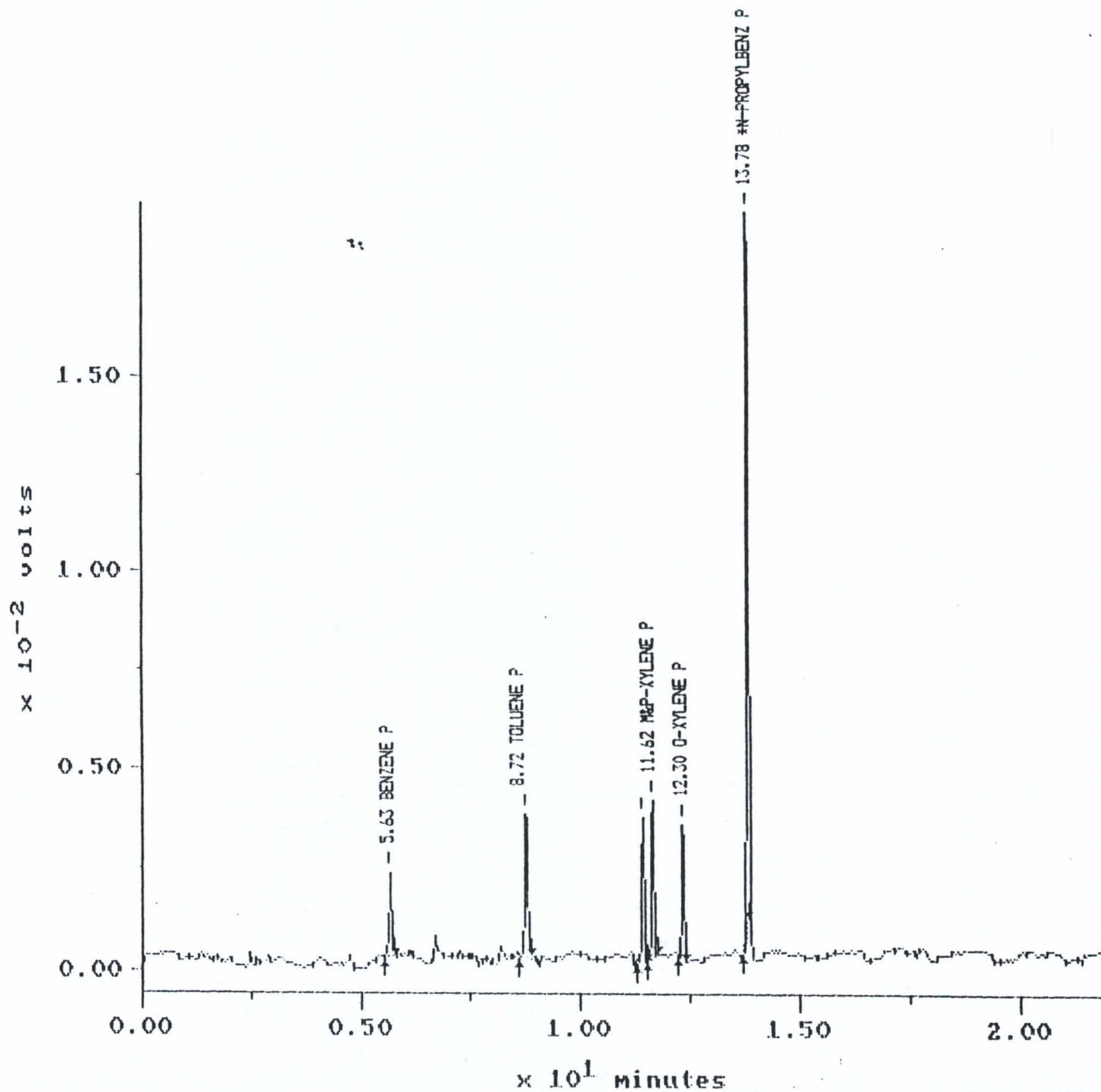
Channel: 5590 PID  
Method: BTX Waters on 5890

Sample: STD #4 1/2500

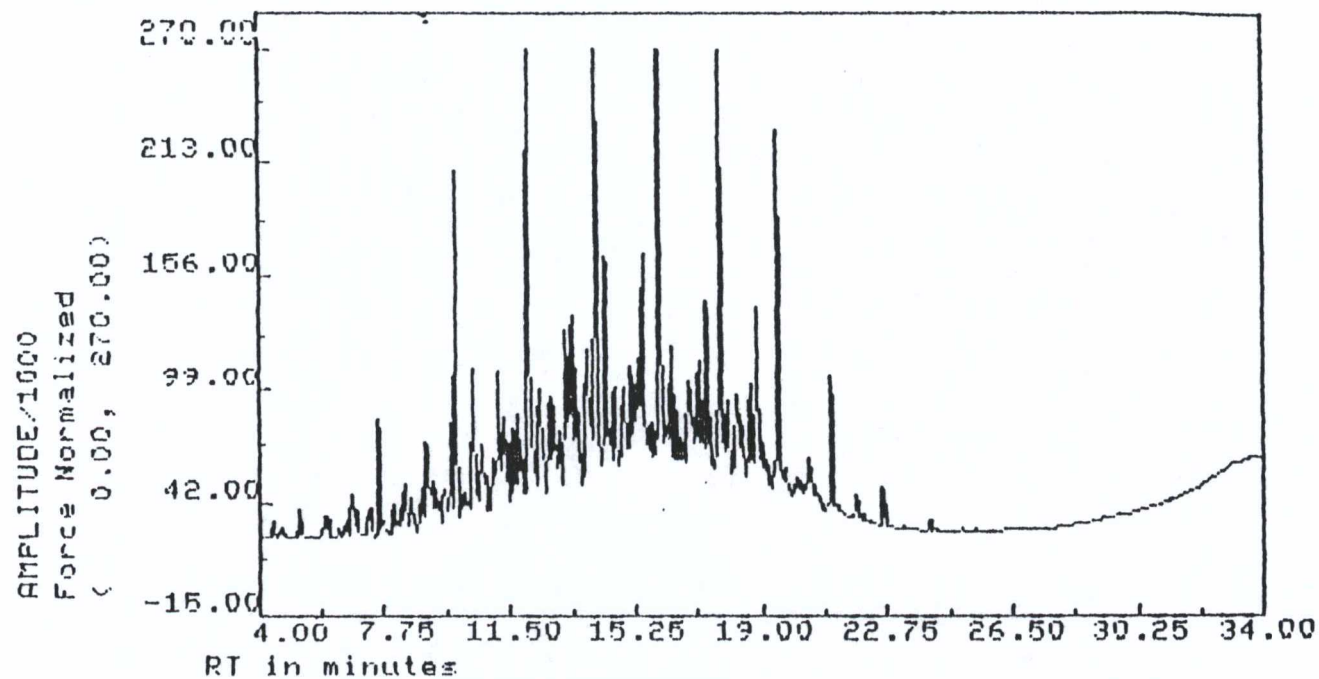
Acquired: 17-JUL-89 10:23

Inj Vol: 1.00

Comments: \* DENOTES SURROGATE



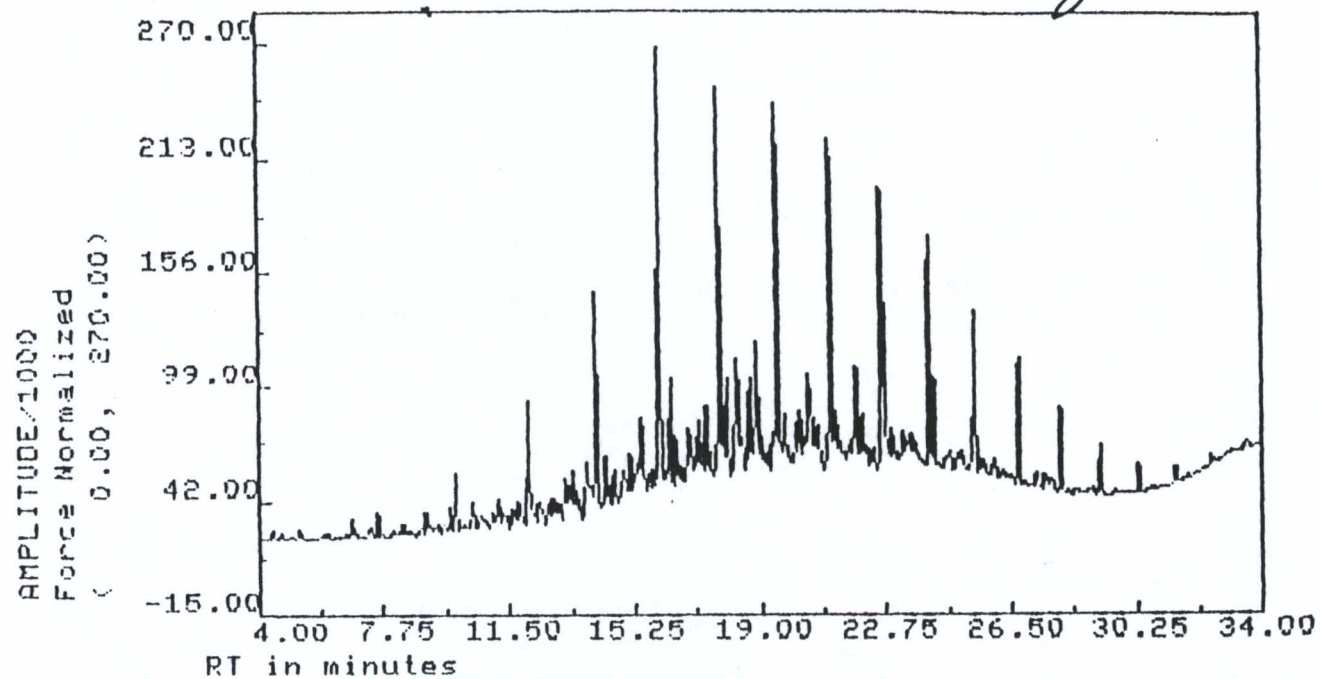
*Kerosene Std 1000 ug/ml*



SAMPLE: KERO1000PPM INJECTED AT 15:18:44 ON JUL 10, 1989  
Meth: NTB Raw: RT10Q2 Proc: \*PRC24



*Diesel Standard 1040 ug/ml*

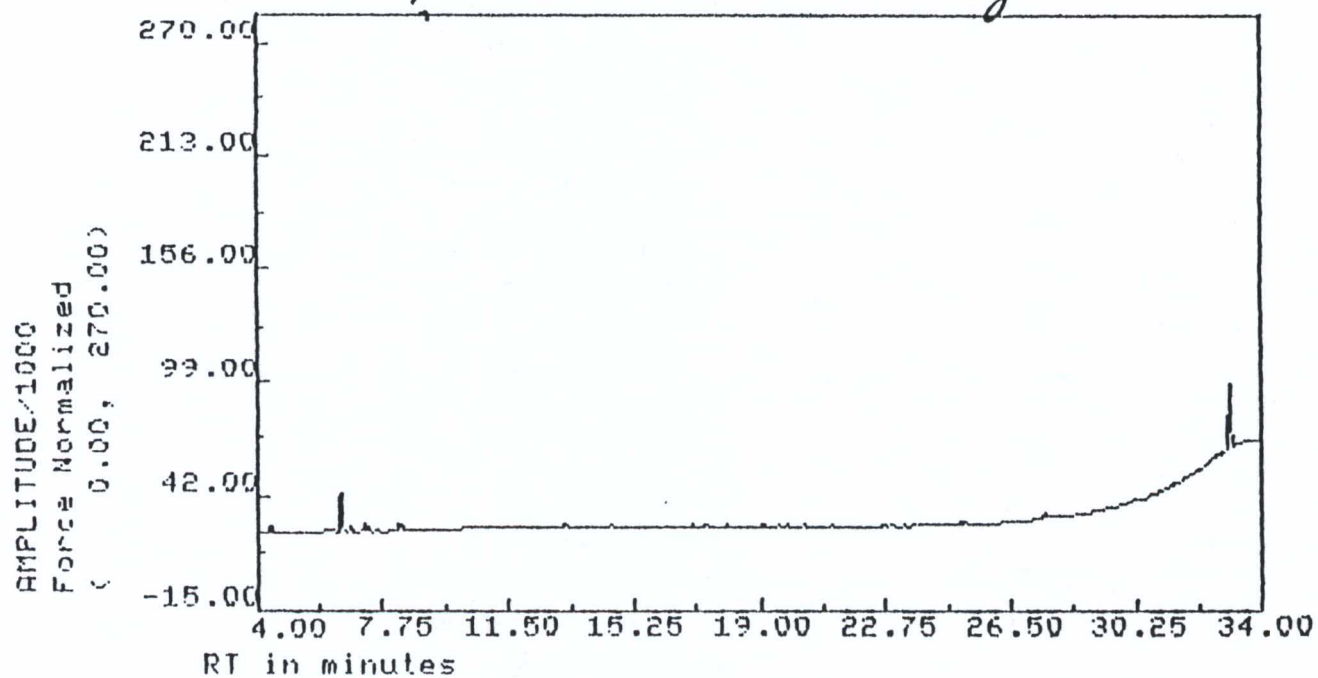


SAMPLE: DSL1040PPH  
Meth: HTB

INJECTED AT 16:19:42 ON JUL 10, 1989  
Raw: RT1003

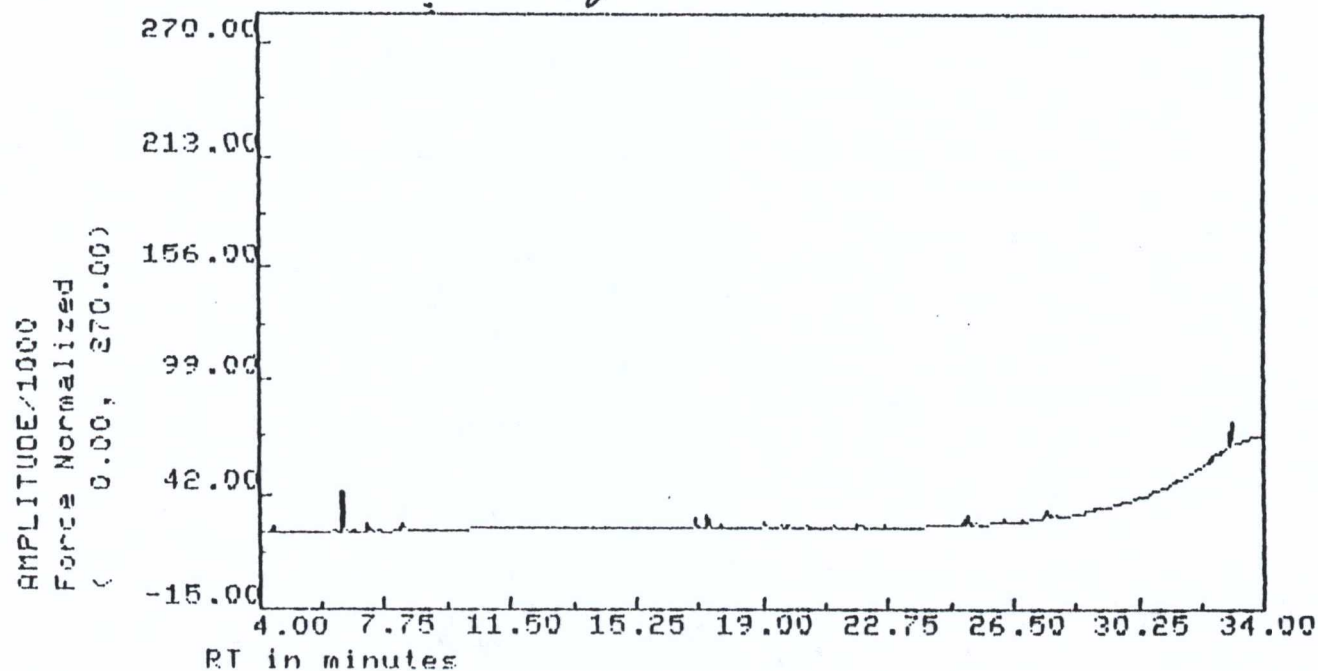
Proc: \*PRC24

Method Blank 30.0g → 1.0 ml



SAMPLE: B07050SVSLO INJECTED AT 18:24:09 ON JUL 10, 1989  
Meth: NTB Raw: RT1005 Proc: \*PRC24

17306-5  
27.0 g → 1.0 ml



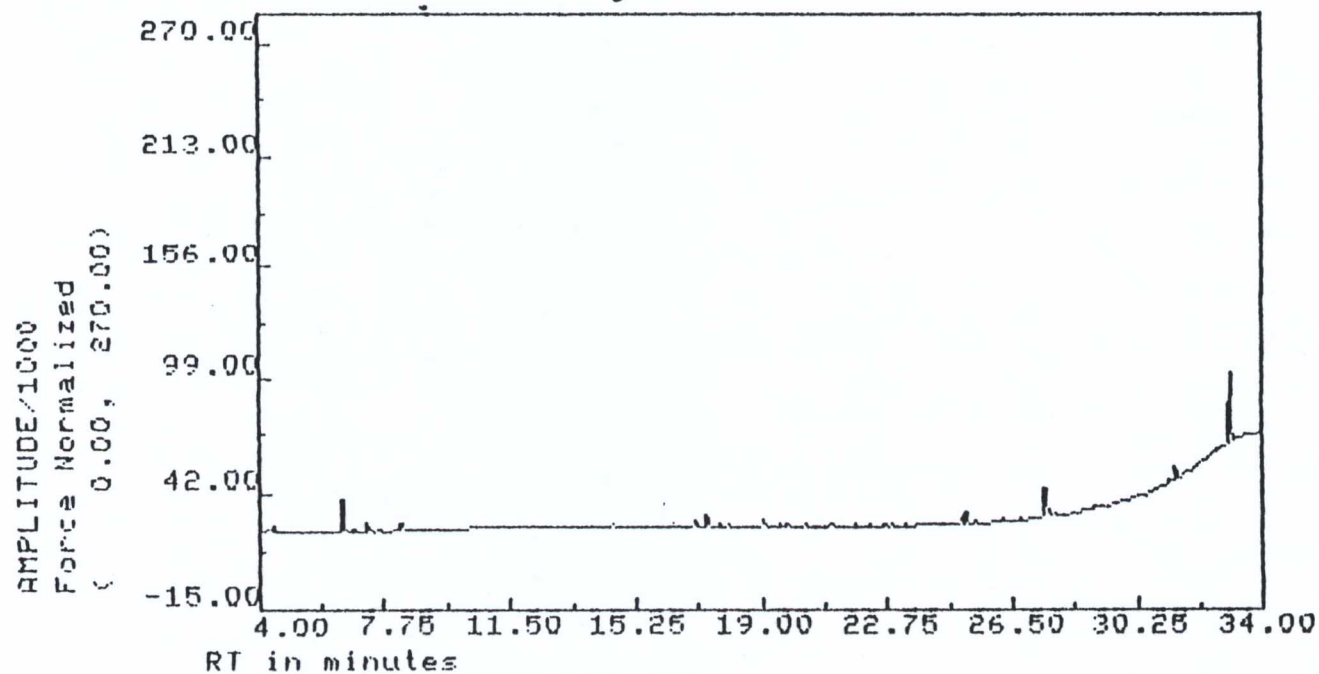
SAMPLE: T17306-5  
Meth: MTB

INJECTED AT 19:25:08 ON JUL 10, 1989  
Raw: RT1006

Proc: #PRC24



17306-3  
25.9g → 1.0ml

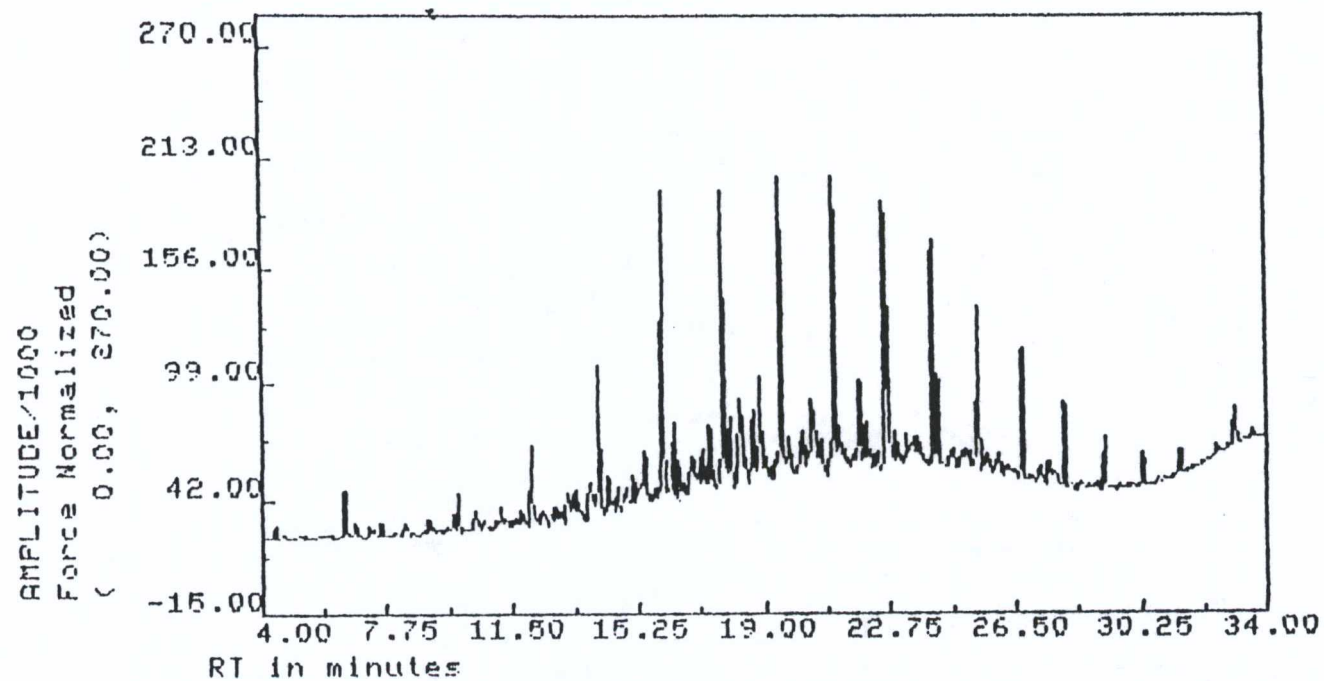


SAMPLE: T17306-3  
Meth: MTB

INJECTED AT 20:26:08 ON JUL 10, 1989  
Raw: RT1007

Proc: \*PRC24

17306-3 Matrix Spike

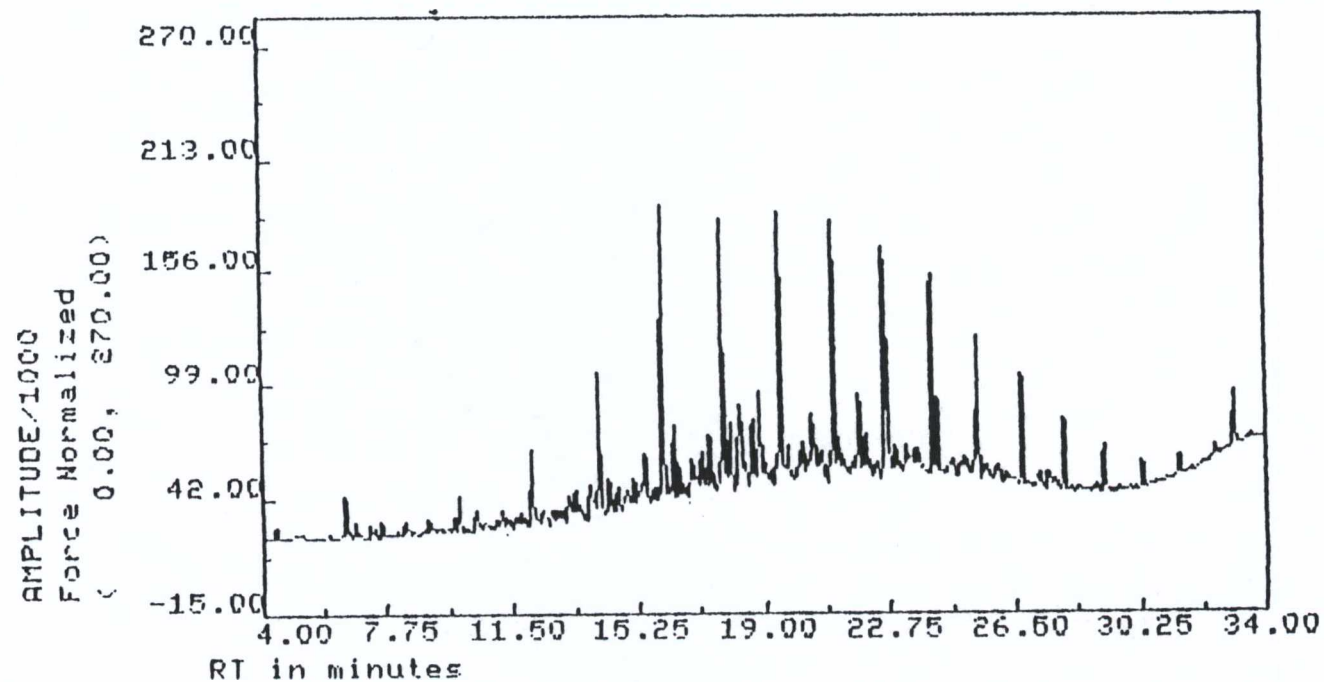


SAMPLE: T17306-3MS  
Meth: NTB

INJECTED AT 21:27:06 ON JUL 10, 1989  
Raw: RT1008

Proc: \*PRC24

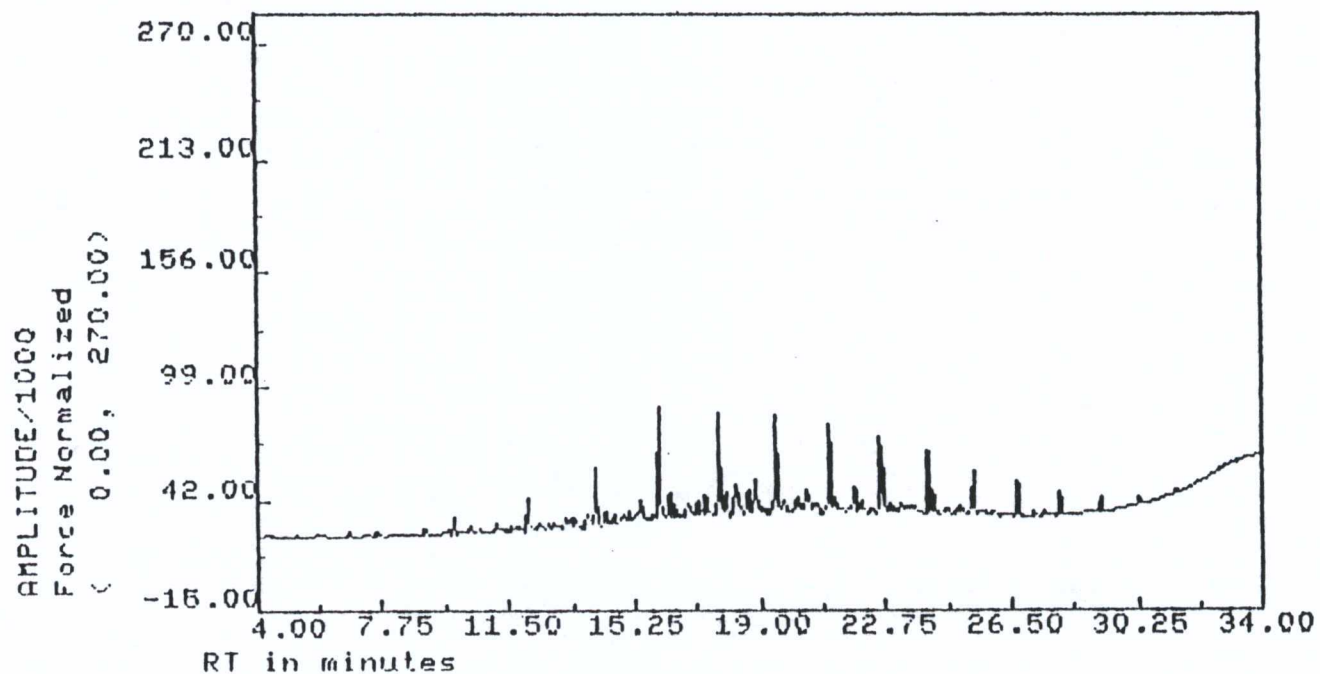
17306-3 Matrix Spike Duplicate



SAMPLE: T17306-3MSD INJECTED AT 22:29:06 ON JUL 10, 1989  
Meth: MTB Raw: RT1009 Proc: \*PRC24



Diethyl Std 260 ug/ml

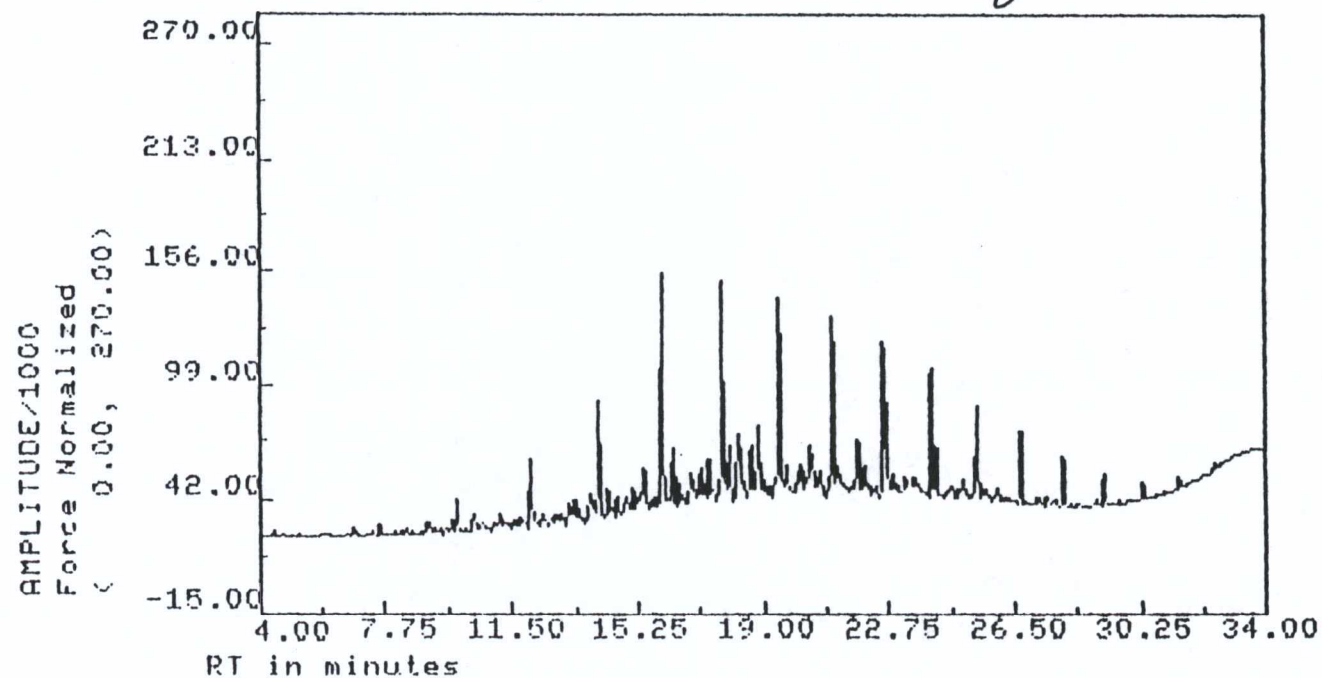


SAMPLE: DSL260PPM  
Meth: MTB

INJECTED AT  
Raw: RT1012

9:41:30 ON JUL 11, 1989  
Proc: \*PRC24

*Diesel Standard 520 µg/ml*



SAMPLE: DSL520PPH  
Meth: HTB

INJECTED AT 10:42:29 ON JUL 11, 1989  
Raw: RT0713 Proc: \*PRC24

# Laucks®

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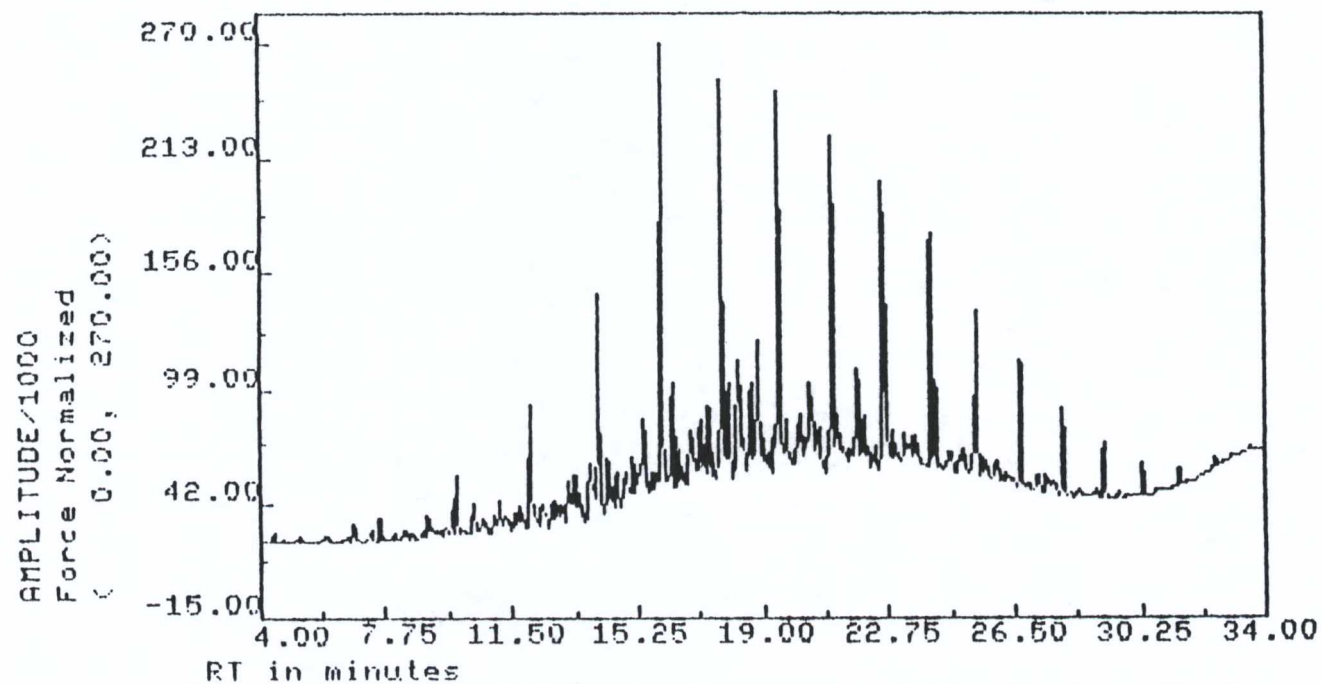
### APPENDIX C

Copy of Chain-of-Custody is Attached



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*Diesel Standard 1040ug/ml*



SAMPLE: DSL1040PPM  
Meth: MTB

INJECTED AT 11:43:29 ON JUL 11, 1989  
Raw: RT0714

Proc: #PRC24





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OF

940 South Harney St. Seattle Washington 98108 (206)767-5060

NAME SCS Engineers			TESTING PARAMETERS												NO. OF CONTAINERS	OBSERVATIONS, COMMENTS, SPECIAL INSTRUCTIONS					
ADDRESS 1008 140TH Ave N.E. Bellevue 98005			Calif. TPH	Archive																	
ATTENTION Greg Holland																					
PROJECT NAME Port of Seattle																					
JOB/PO NO 0489009.00 T-91																					
SAMPLE # (SIGNATURE) Greg Holland			(PRINTED NAME) Greg Holland																		
LAB NO	LAB SA #	SAMPLE NO.	DATE	TIME	LOCATION																
1		BH1-5	6/28		Terminal 91		X											1			
2		BH1-6	}	}	}		X											1			
3		BH1-10					X													1	
4		BH2-3					X													1	
5		BH2-6					X													1	
RELINQUISHED BY Greg Holland			DATE 6/28/89	RECEIVED BY [Signature]			DATE	TOTAL NUMBER OF CONTAINERS: 5										SHIPMENT METHOD:			
SIGNATURE Greg Holland			TIME 12:30p	SIGNATURE			TIME	INSTRUCTIONS: 1. Shaded areas for lab use only. 2. Complete in ballpoint pen. Draw one line through errors and initial. 3. Be specific in test requests. 4. Check off tests to be performed for each sample. 5. Retain final copy after signing. 6. Provide name and telephone of your contact person.										SPECIAL SHIPMENT, HANDLING OR STORAGE REQUIREMENTS			
PRINTED NAME				PRINTED NAME																	
COMPANY				COMPANY																	
RELINQUISHED BY			DATE	RECEIVED BY Fran Collins			DATE 6/28/89														
SIGNATURE			TIME	SIGNATURE			TIME 12:30														
PRINTED NAME				PRINTED NAME																	
COMPANY				COMPANY																	



Testing Laboratories, Inc.

940 South Harney St., Seattle, WA 98108 (206) 767-5060 FAX 767-5063

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Chemistry, Microbiology, and Technical Services

APPENDIX B

Copies of Chromatograms are Attached



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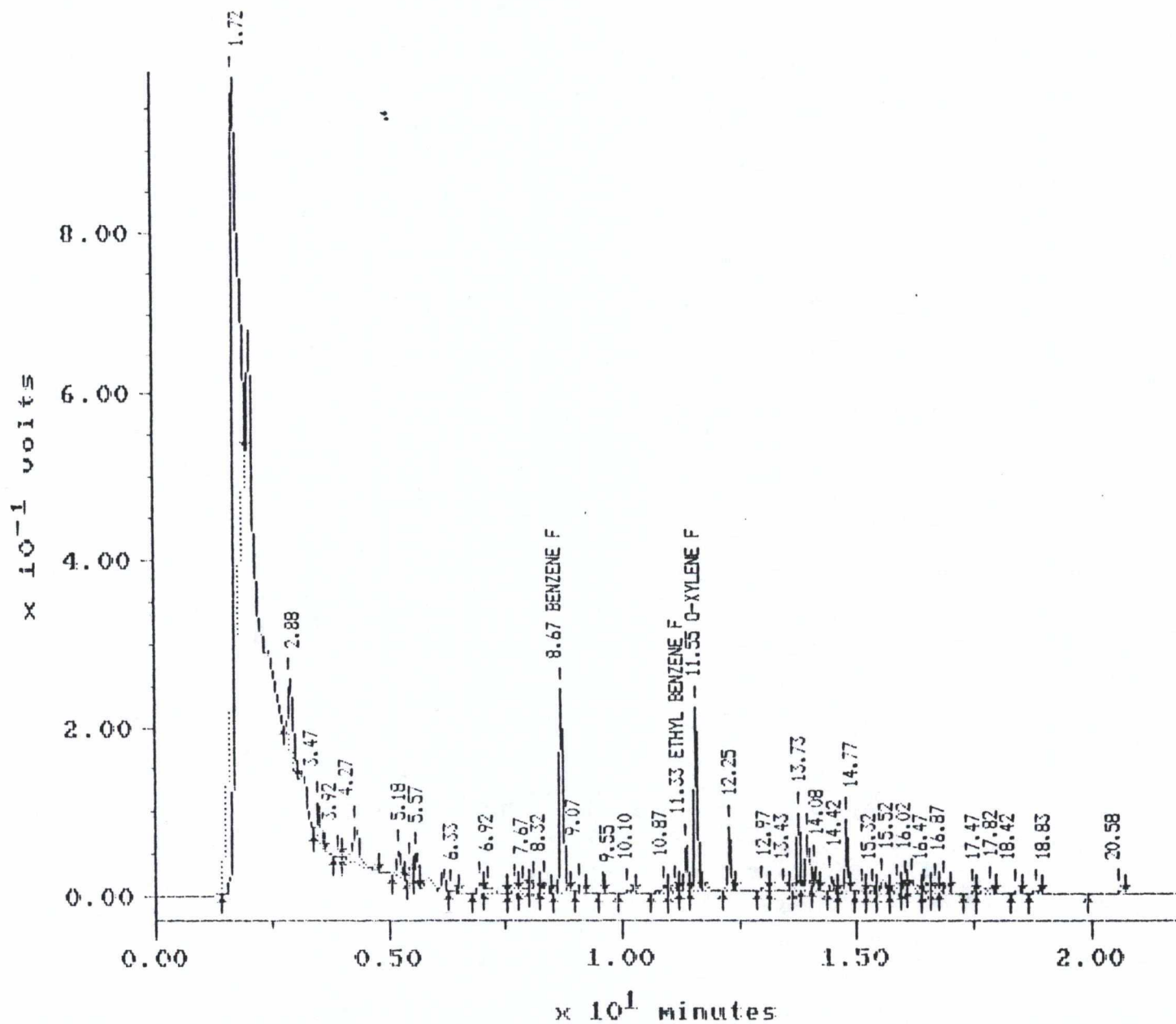


gasoline standard @ 400ppb

Filename: C06i31  
Operator: Bill  
Inj Vol: 1.00

Channel: 5890 FID  
Method: SIX Waters on 5890  
Amount: 10.000

Sample: GAS STD # 1  
Acquired: 13-JUN-89 10:03  
Dilution: 1 : 1.000  
Comments: \* DENOTES SURROGATE

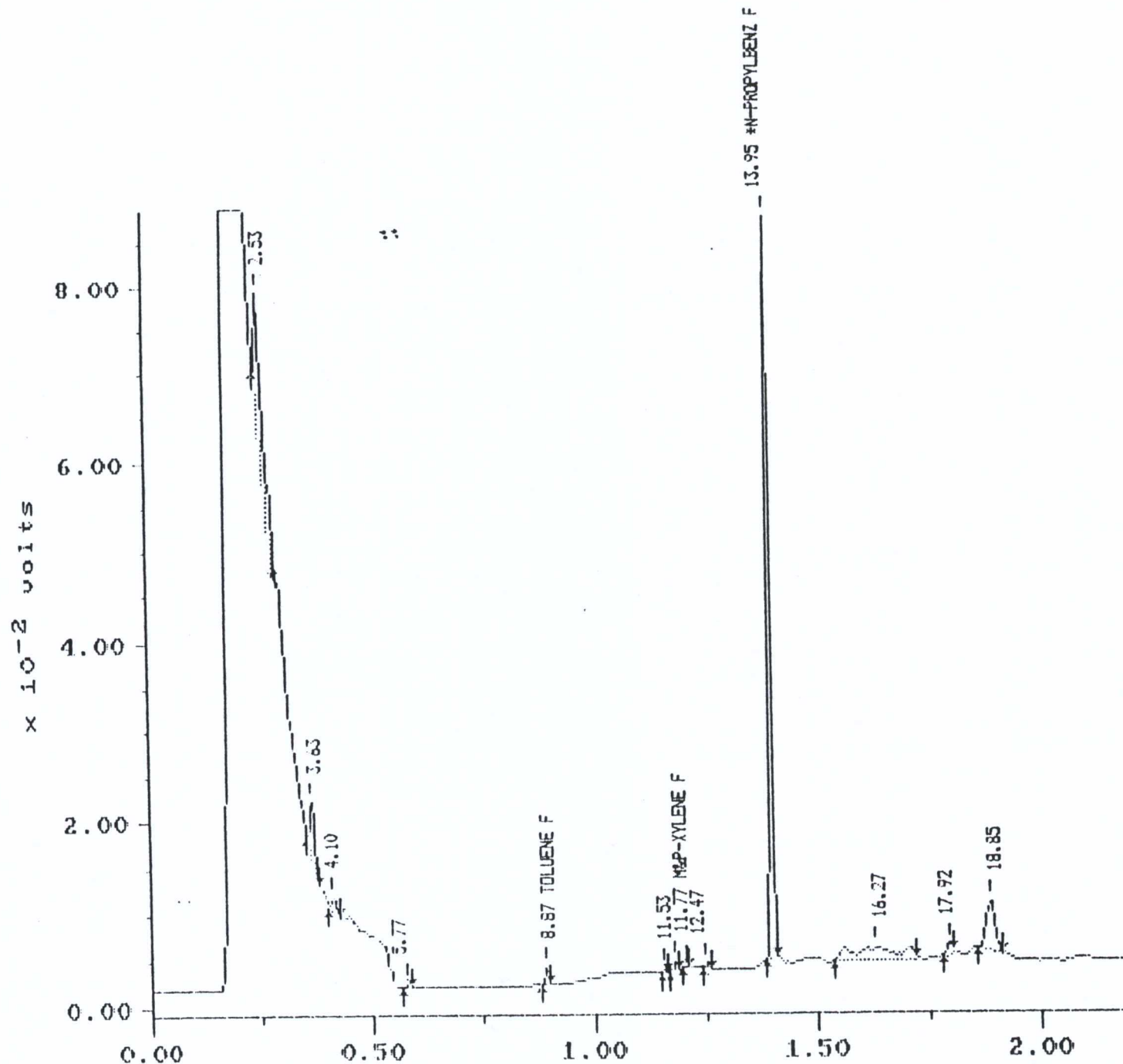




Filename: 007184  
Operator: Bill  
Inj Vol: 1.00

Channel: 5890 FID  
Method: BTX Waters on 5890  
Amount: 1.110

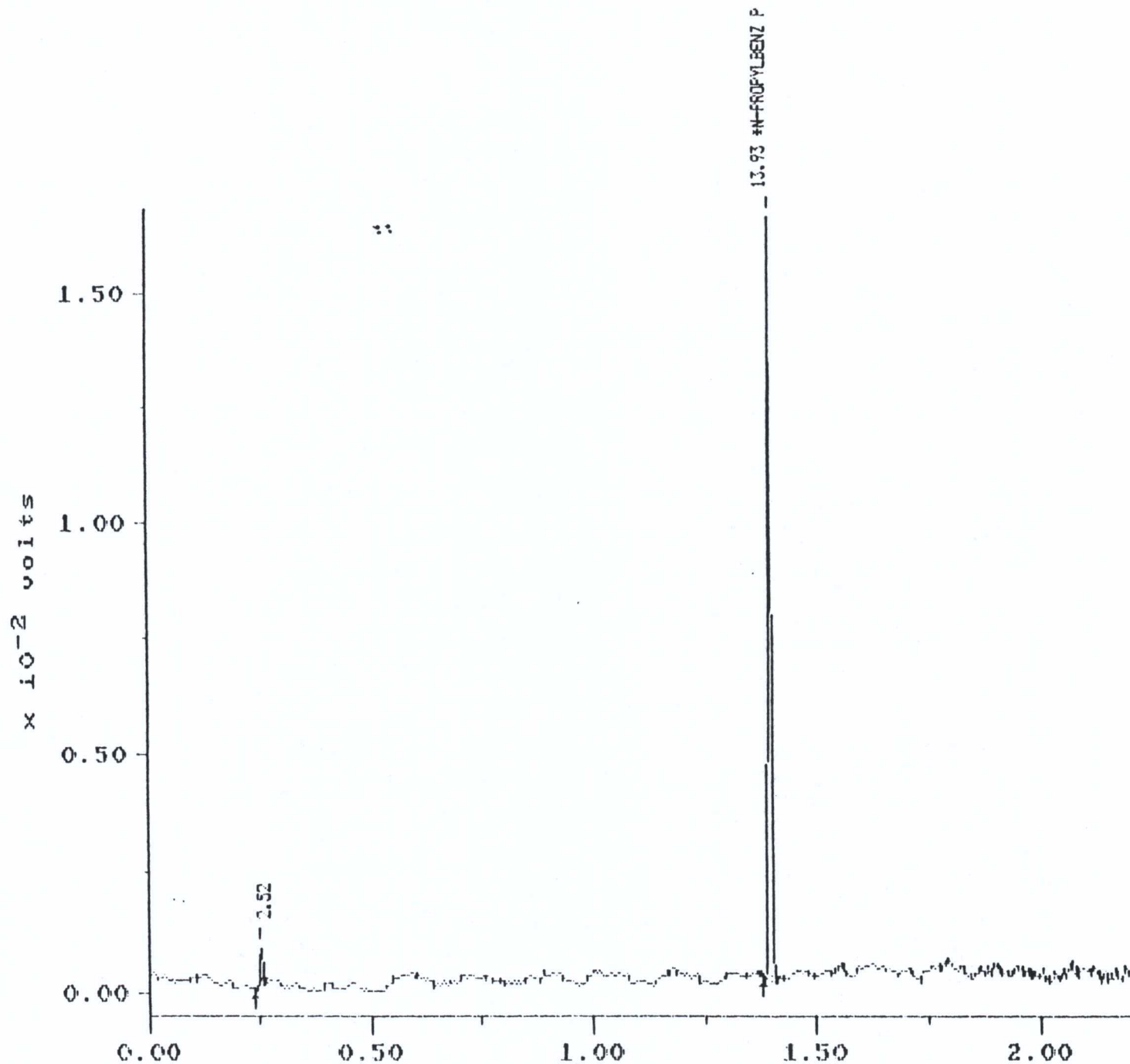
Sample: 17305-3  
Acquired: 18-JUL-89 12:00  
Dilution: 1 : 1.000  
Comments: \* DENOTES SURROGATE



Filename: C07184  
Operator: Bill  
Inj Vol: 1.00

Channel: 5890 FID  
Method: BTK Waters on 5890  
Dilution: 1 : 1.000  
Amount: 1.110

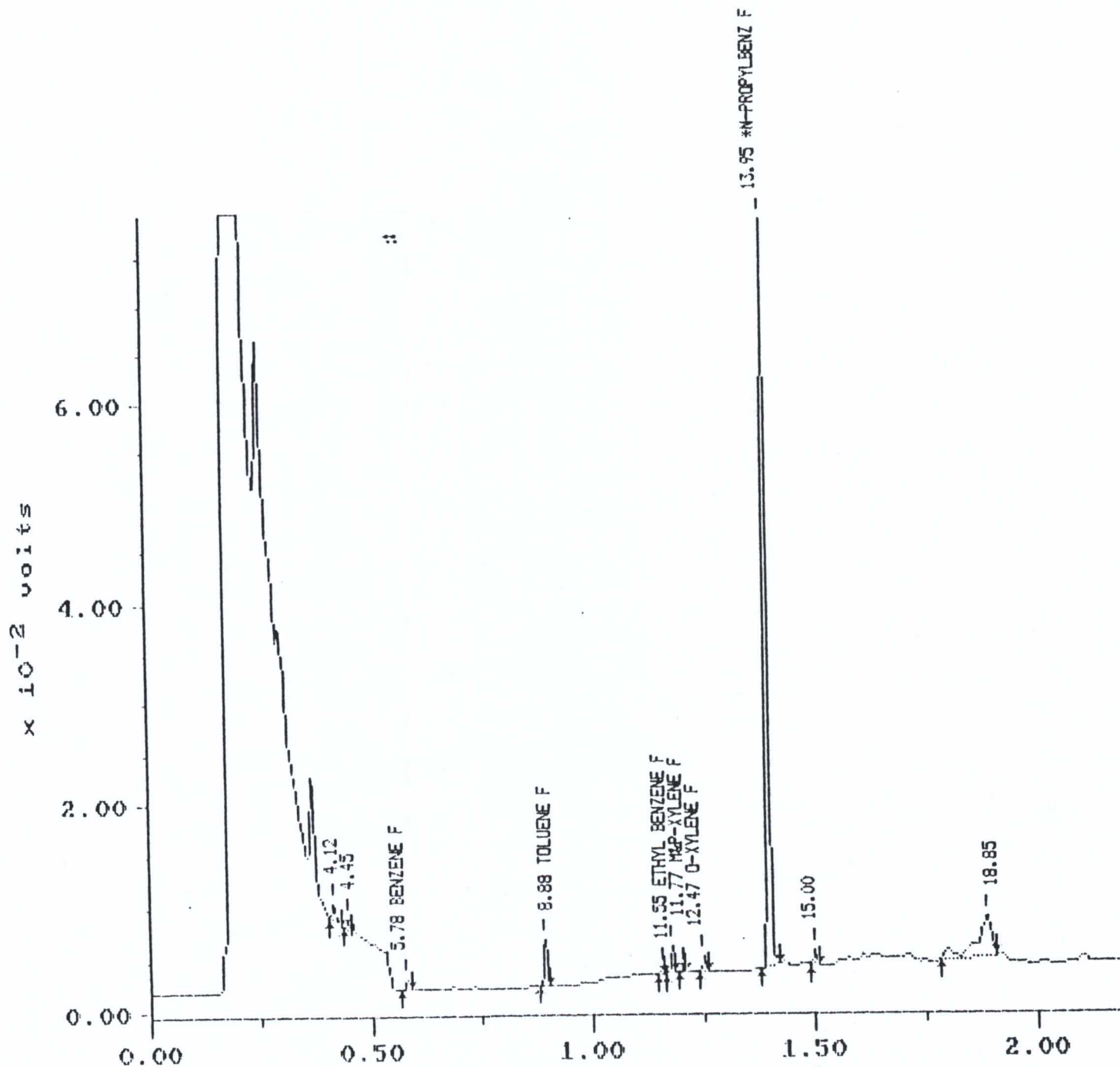
Sample: 1750a-7  
Acquired: 18-JUL-89 12:00  
Comments: \* DENOTES SURROGATE



Filename: 007185  
Operator: Sil  
Inj Vol: 1.00

Channel: 5390 FID  
Method: SIX Waters on 5390  
Amount: 1.210

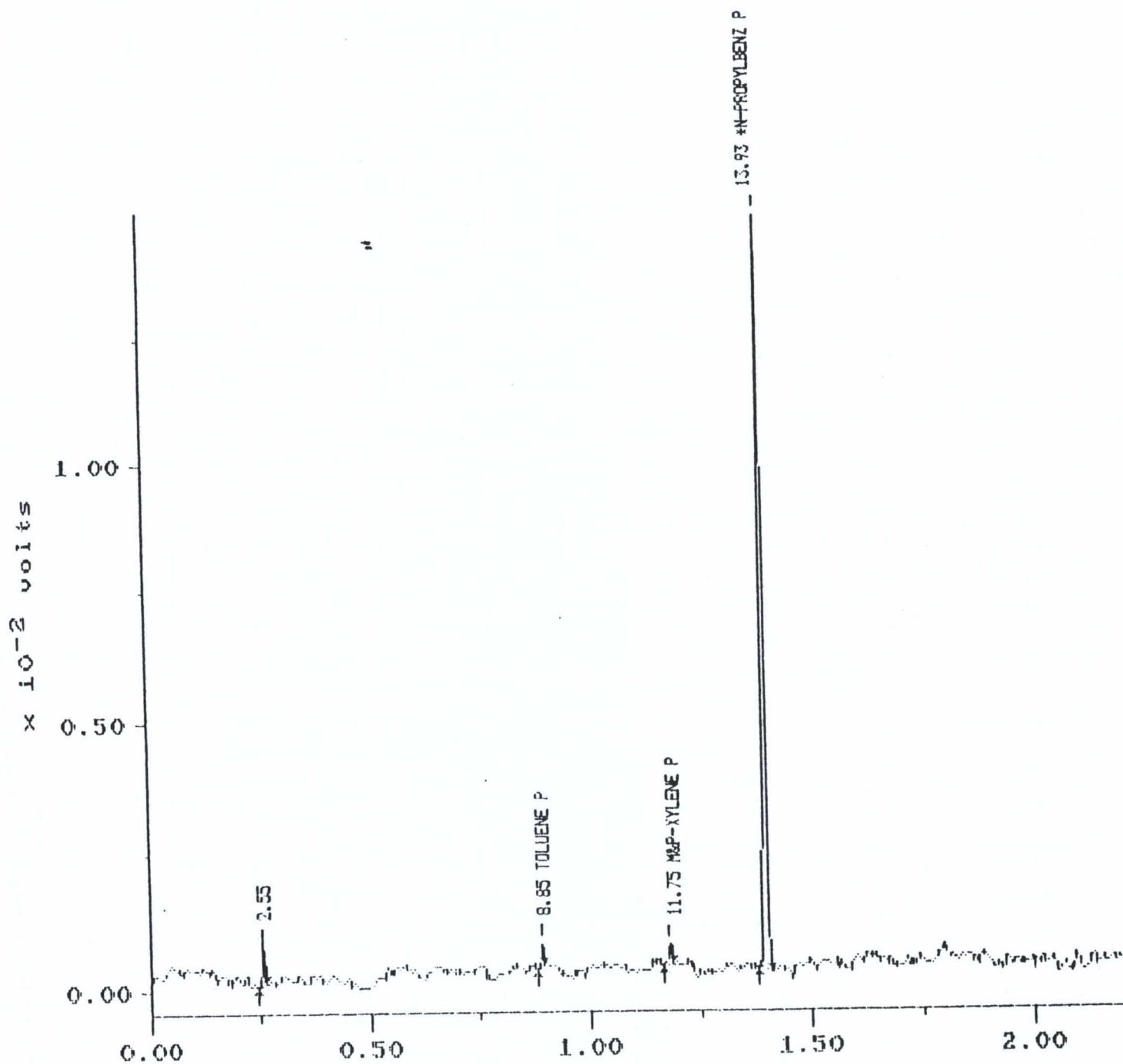
Sample: 17306-5  
Acquired: 18-JUL-89 12:30  
Dilution: 1 : 1.000  
Comments: \* DENOTES SURROGATE



Filename: C07185  
Operator: Bul  
Inj Vol: 1.00

Channel: 5590 FID  
Method: BTX Waters on 5590  
Amount: 1.210

Sample: 1730a-3  
Acquired: 18-JUL-89 12:30  
Dilution: 1 : 1.000  
Comments: \* DENOTES SURROGATE



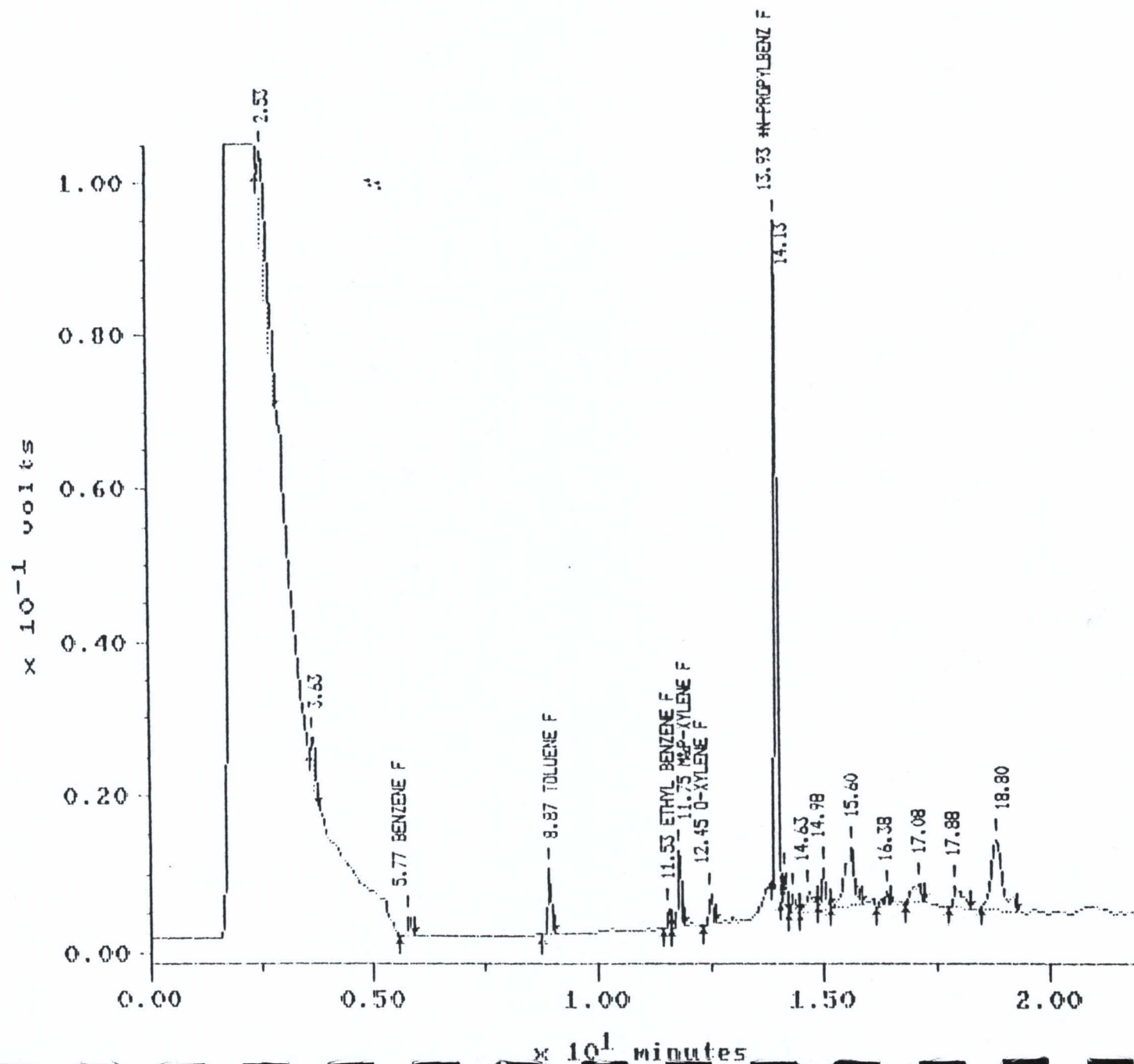
x 10<sup>-2</sup> minutes



# Reagent blank

Sample: E07153V0.S01  
 Channel: 5990 FID  
 Acquired: 18-JUL-99 11:30  
 Dilution: 1 : 1.000  
 Comments: \* DENOTES SURROGATE

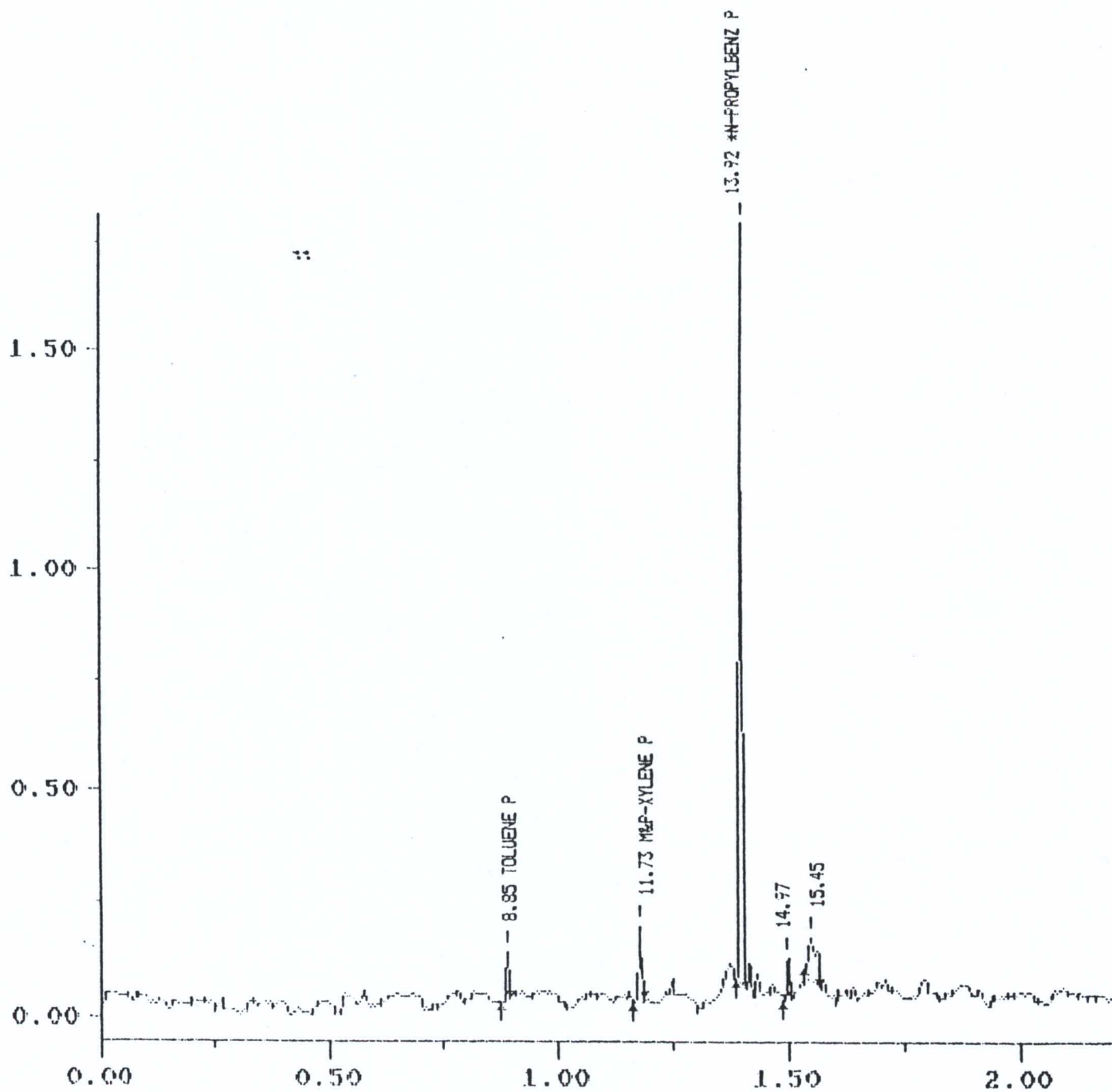
Filename: E07153  
 Operator: 511  
 Inj Vol: 1.00



Filename: 507187  
Operator: B11  
Inj Vol: 1.00

Sample: 507186V0.S01  
Channel: 5890 PID  
Acquired: 18-JUL-89 11:30  
Dilution: 1 : 1.000  
Comments: \* DENOTES SURROGATE

$\times 10^{-2}$  volts

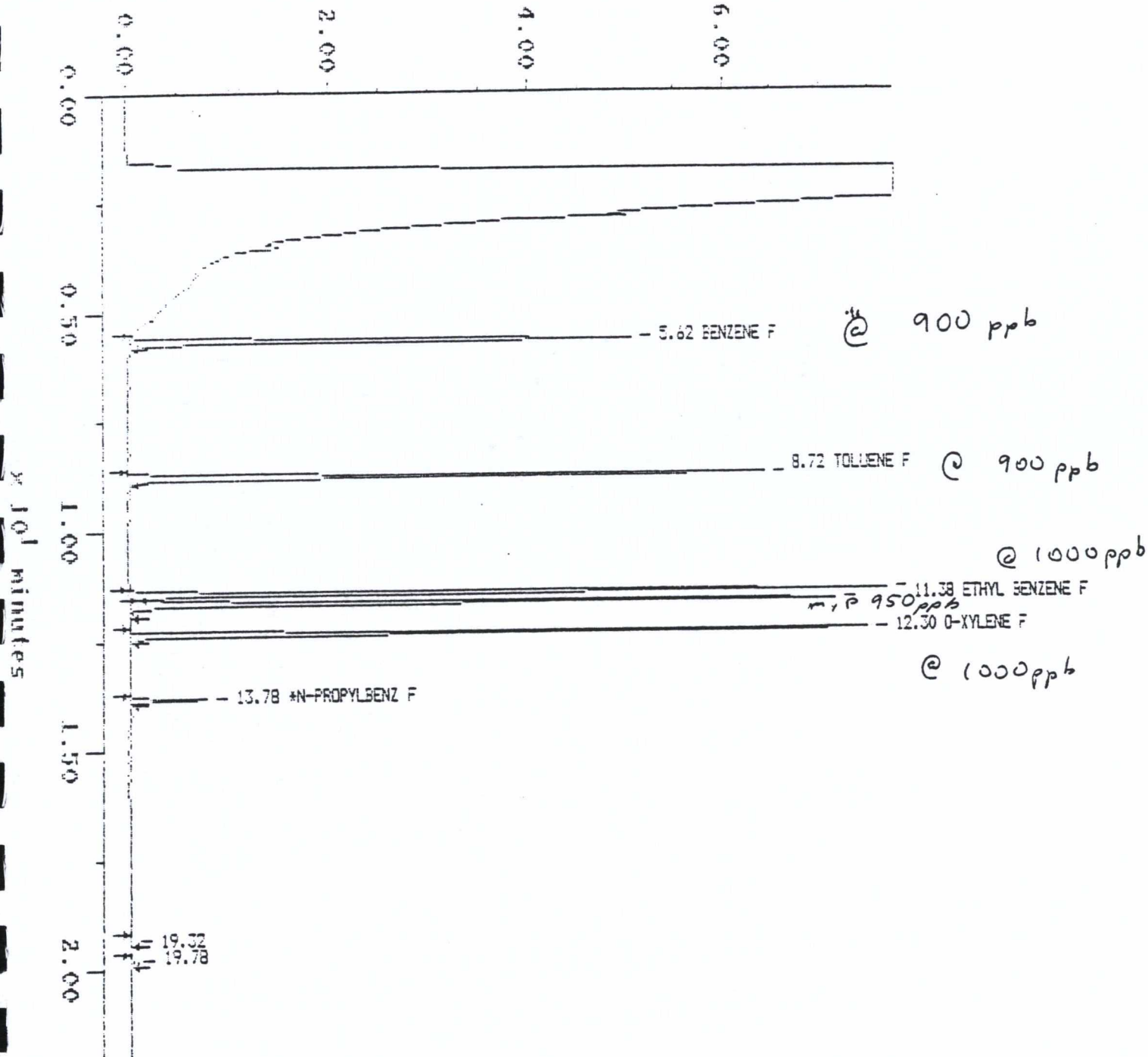


$\times 10^1$  minutes

Sample: STD #1 1/30 Channel: 8890 FID  
Acquired: 17-JUL-89 8:07 Method: STA waters on 8890  
Inj Vol: 1.00  
Comments: + IDENTIFIED SURROGATE

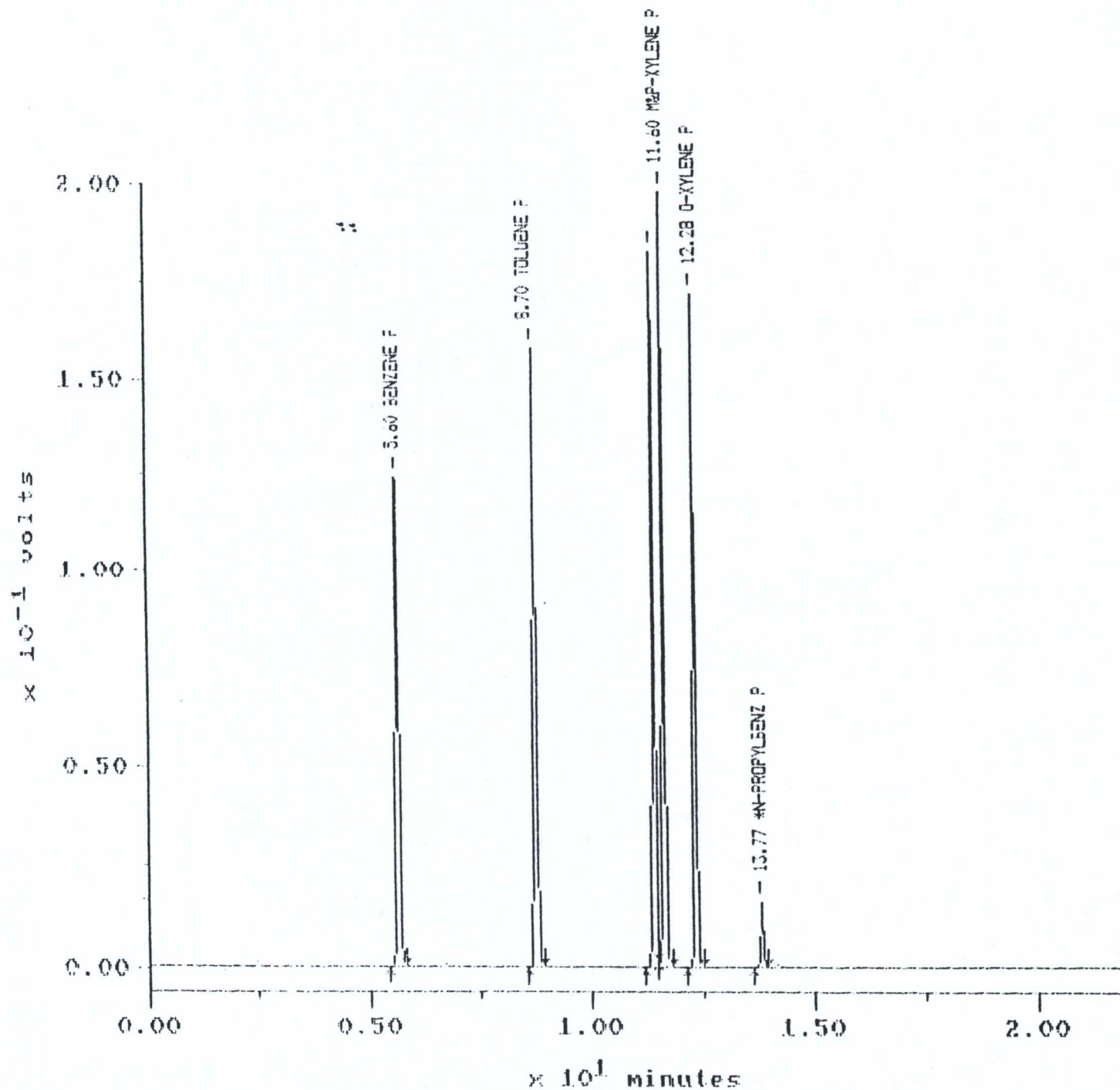
Filename: 007171  
Operator: Bill

$\times 10^{-1}$  Volts



Filename: 00717  
Operator: 511

Sample: STD #1 1750 Channel: 5550 FID  
Acquired: 17-JUL-89 9:07 Method: STA Waters on 5550  
Inj Vol: 1.00  
Comments: \* SEVENTES BUREAUITE

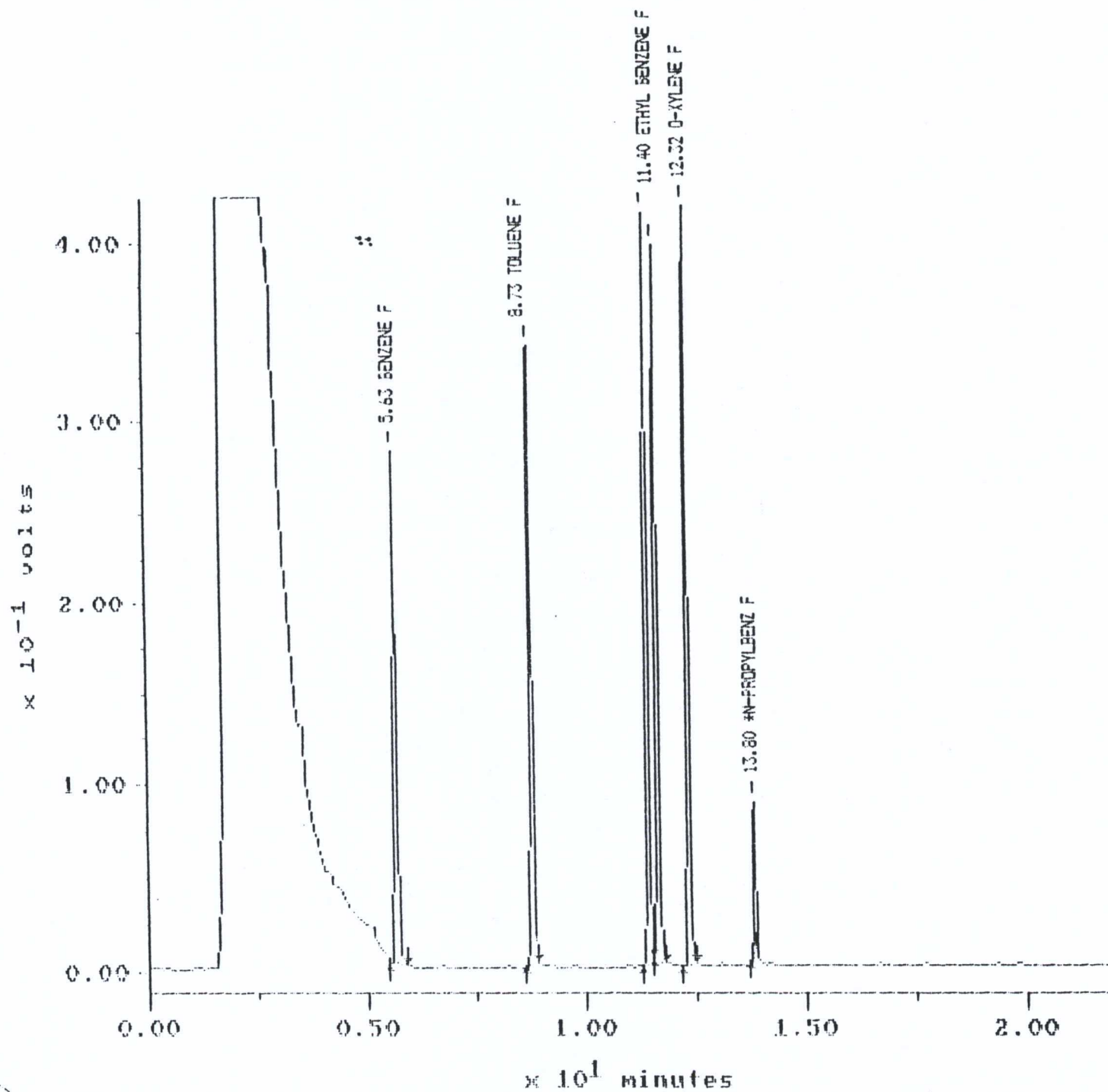




Filename: 55717-  
Operator: 511

Channel: 5550 FID  
Method: 51A Waters on 5550

Sample: STD #2 1/100  
Acquired: 17-JUL-89 9:25  
Inj Vol: 1.00  
Comments: + DENOTES SURROGATE



Filename: 007172  
Operator: 811

Sample: STD #1 1.100 Channel: 5570 FID  
Acquired: 17-JUL-89 7:23 Method: STD Waters on 5570  
Inj Vol: 1.00  
Comments: + DENOTES SURROGATE

